



THE TENTH YOUNG ECONOMISTS' SEMINAR

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Socialist Growth Revisited: Insights from Yugoslavia

Hotel "Grand Villa Argentina"

Dubrovnik

June 7 – 9, 2015

Draft version

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CROATIAN NATIONAL BANK

Socialist growth revisited: Insights from Yugoslavia

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May 2015

ABSTRACT

Beyond the very recent past, and beyond the Soviet Union, we know very little about the nature of economic performance of eastern European countries. This paper fills the knowledge void by providing an analytic narrative of socialist Yugoslavia, through using a diagnostic tool that identifies the mechanisms that drive economic growth – business cycle accounting. The analysis reveals that total factor productivity growth became more important over time in sustaining economic growth. Labour frictions were a major constraint on growth since the mid-1960s. Socialist growth was primarily handicapped by poor incentives to work, rather than by poor incentives to innovate or to adopt foreign technology.

1. Introduction

Economists and historians alike have long sought to understand why some countries are rich while others are poor. Yet, beyond the very recent past, and beyond the Soviet Union, the economic development of eastern European countries is under-explored.² The successor states of Yugoslavia, with the notable exception of Slovenia, have barely grown over the past 30 years. In 2010, the GDP per capita of the successor states of Yugoslavia was only 8 per cent higher than in 1979 (Bolt and van Zanden, 2014).³ By contrast, in the whole of eastern Europe, in the same period, GDP per capita increased by 48 per cent. To understand the relative stagnation of the economies that were once part of Yugoslavia, it is necessary to understand their historic sources of growth – what worked and failed, and why.

The comparative economic development in Europe during the post-war period, under two radically different political and economic regimes, had attracted a great deal of interest. The performance of centrally planned eastern European economies is well established. During the European “Golden Age” of economic growth in the 1950s and the 1960, planned economies were able to achieve relatively high growth rates. In the subsequent decades, primarily in the 1980s, the performance of planned economies became dismal (see e.g. Eichengreen, 2008). A well-established view is that growth in the 1950s and the 1960s was based on the expansion of capital (both physical and human capital) and labour, and the reallocation of resources

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² Eastern Europe is defined in this paper as the region encompassing the centrally planned European economies during the post-war period.

³ The successor states of Yugoslavia are Bosnia and Herzegovina, Croatia, Macedonia, Montenegro, Serbia, and Slovenia. Kosovo is treated as part of Serbia, since Bolt and van Zanden (2014) do not provide data observations for Kosovo.

from agriculture to manufacturing and modern services. As these sources of growth are intrinsically limited, the argument continues, planned economies were bound to fail (Krugman, 1994).

The inability of eastern European countries to converge towards income levels of their market-oriented neighbours has been mostly attributed to the embedded in-efficiencies of centrally planned economies (Kornai, 1980). The core of the argument is that employers and employees faced poor incentives since property was state owned (Bardhan and Roemer, 1993). A more nuanced argument bifurcates the economic performance of planned economies into different periods. Broadberry and Klein (2011) argue that eastern European economies performed relatively well in an era of mass production during the 1950s and the 1960s, but were unable to achieve satisfactory productivity performance with the onset of flexible production technology in the late 1970s and the 1980s.

The study of socialist growth is typically characterised by two issues that this paper attempts to amend. First, the majority of existing studies on the region focused on the Soviet Union.⁴ The downside of this tendency is that the economic performance of the Soviet Union is often taken to be representative of the whole region, which masks the heterogeneity of countries in eastern Europe. A case study, beyond the Soviet Union, allows for an in-depth treatment of economic performance, and the possibility of distinguishing between the general and particular features of socialist growth. By providing a detailed analytic narrative of Yugoslavia within a comparative perspective, this paper seeks to shed additional light on the performance of centrally planned economies.

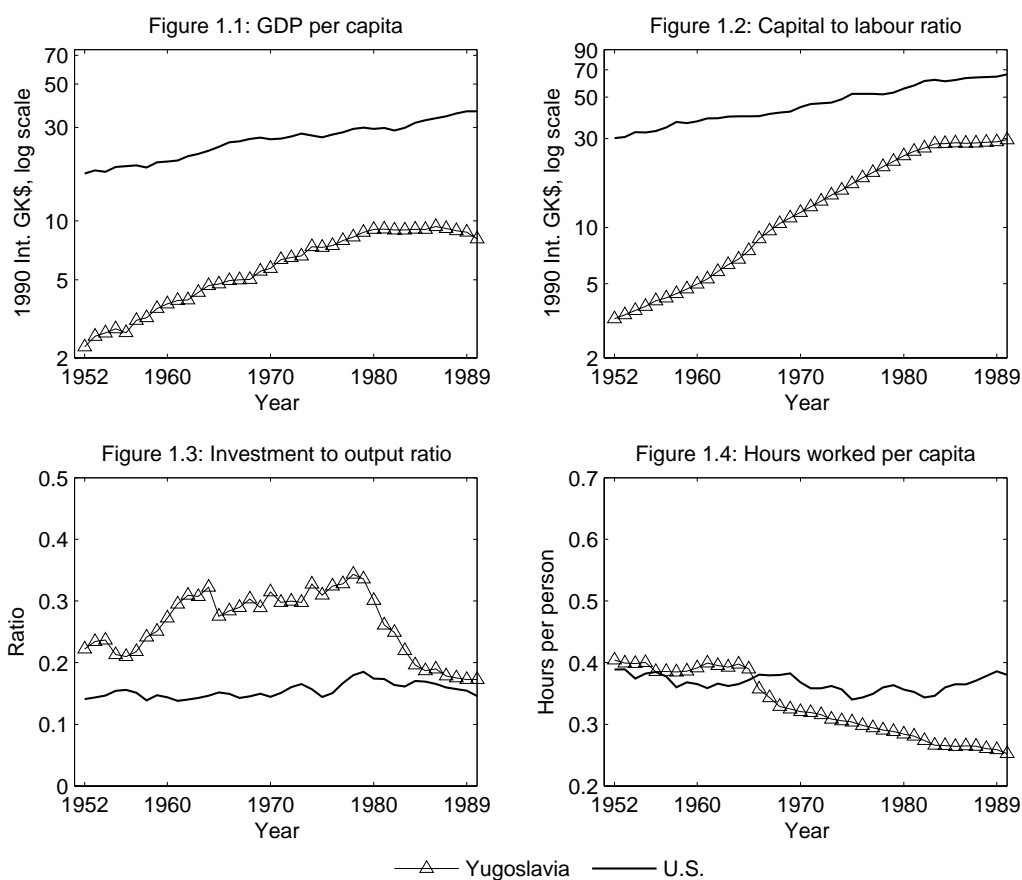
Figure 1 presents basic macroeconomic indicators of Yugoslavia. Identical data is also shown for the U.S. - the global productivity leader – in order to contextualise Yugoslav economic performance. Between 1952 and 1989, GDP per working age person in Yugoslavia grew by 3.6 per cent on an average annual basis, as compared to 2 per cent in the U.S.⁵ In the same time period, Yugoslav capital to labour ratio grew on average by 4.6 per cent per annum – twice as fast as in the U.S. The Yugoslav investment to output ratio rose from approximately 0.2 in the 1950s, to 0.3 in the 1960s and the 1970s – roughly twice as high as the U.S. investment to output ratio in the 1960s and the 1970s – before collapsing to under 0.2 by the mid-1980s. These investment rates are somewhat higher than Western European investment rates during the “Golden Age” of the 1950s and the 1960s (Eichengreen, 2008), but are broadly similar to investment rates in the fast growing East Asian countries (Hong Kong, Singapore, South Korea, and Taiwan) during a similar period (Young, 1995).⁶ Until the mid-1960s, hours worked per working age person (the ratio of total hours worked to the working age population) were broadly similar in Yugoslavia and the U.S. Subsequently, Yugoslav hours worked per capita embarked on a downward trend, reaching 0.25 by the late 1980s.

⁴ See for example Allen (2003) for an economic history of the Soviet Union.

⁵ 1952 is chosen as the initial year due to data availability. 1989 is chosen as the final year, since in 1990 Yugoslavia started disintegrating. The growth rates are logarithmic.

⁶ Of course, such generations depend on the exact comparison. Young (1995) reports that the Singaporean investment to output ratio peaked at close to 0.5 in 1984, while the investment to output ratio of South Korea reached 0.4 by the beginning for the 1990s – thus, reaching levels that were significantly higher than in Yugoslavia at any point in time.

Figure 1: The evolution of macroeconomic indicators in Yugoslavia and in the U.S., 1952-90.



Note: Capita is defined as working age person, while labour is defined as total hours worked ((average yearly hours worked per employee) x (total number of employees)). Hours worked per capita are total hours worked divided by the working age population.

Source: U.S. and Yugoslav GDP are taken from Maddison (2010). U.S. investment and capital stock data is taken from the U.S. Bureau of Economic Analysis (BEA), while the U.S. labour and capita data is taken from the Total Economy Database (TED) of the Conference Board. Yugoslav further sources of data are elaborated in section 4.1.

Yugoslav economic performance, therefore, can be clearly segmented into the relatively successful pre 1979 period, and the dismal post 1979 period, instigated by the second oil shock, that culminated in the fall of communism and the violent disintegration of the country. As such, this paper, like Allen (2003) and Broadberry and Klein (2011), rejects a fully negative assessment of socialist economic performance.

A second issue encountered in the literature on comparative socialist growth is that it typically relies on a comparison of basic indicators of economic performance, like productivity and economic growth (van Ark, 1996; Broadberry and Klein, 2011).⁷ The hypothesised arguments are typically not quantified, or empirically tested. In order to analyse

⁷ I.e., comparing similar macroeconomic indicators as in the previous paragraph.

the evolution of planned economies, several growth accounting exercises have been undertaken to determine the proximate sources of growth (Balassa and Bertrand, 1970; Vonyó, 2010). Growth accounting exercises are immensely useful for establishing facts regarding the evolution of economies over time. Nevertheless, since growth accounting focuses only on the supply side of the economy, it cannot provide an explanation for the evolution of capital, labour, and total factor productivity (TFP).

Having the aforementioned empirical issues in mind, how can one account for both the success and failure episodes of socialist growth? This paper applies “business cycle accounting” (BCA) methodology developed by Cole and Ohanian (2002) and Chari et al. (2007), among others. BCA is a diagnostic tool like growth accounting, but furthermore moves towards the direction of explanations. As a dynamic general equilibrium model, it confers two major advantages. First, it adds a timing dimension. Second, it identifies the incentives that drive the accumulation of capital and labour.⁸ Taken together, the model is capable of canvassing a more nuanced picture depicting the evolution of socialist growth.

This paper presents two key findings. First, until the 1980s, the importance of TFP in sustaining growth increased over time. It is a novel finding, made possible through adding a timing dimension. This finding reconciles the conflicting findings in the literature regarding the relative contributions of factor inputs and TFP to economic growth (Balassa and Bertrand, 1970; Weitzman, 1970; Sapir, 1980; Bergson, 1983; Kontorovich, 1986). Furthermore, TFP did not drive the deceleration of growth in the 1980s.

Second, the labour wedge, or the incentive to work, consistently deteriorated since the mid-1960s, and drove the collapse of Yugoslav growth during the 1980s. Thus, if socialist economies were characterised by poor incentives that had caused the collapse of their regimes, these poor incentives were reflected in labour frictions. These poor incentives are not necessarily related to incentives to innovate or to adopt foreign technology (Broadberry and Klein, 2011), but rather more prosaic ones, like the incentive to work. This does not mean that disincentives to innovate were un-important, but rather that labour frictions were a quantitatively more important factor in causing the deteriorating of economic performance.

The finding that labour frictions were a major constraint on growth is in line with Weitzman (1970), Sapir (1980), and Easterly and Fischer (1995), among others. They argued that labour constraints retarded economic growth in planned economies. The common finding, however, is based on quite different conceptual foundations from what is applied in this paper - it will be elaborated latter in the text.

The findings of this paper point to potentially fruitful areas of research that could enhance our understanding of socialist growth. In regards to poor incentives that firms and households faced, more research is needed to understand labour frictions, or the incentive or ability of individuals to provide work effort. We also require further research in uncovering the underlying drivers of TFP. The empirical literature suggests that socialist TFP was driven by

⁸ Unless stated otherwise, capital in this paper is generally broadly defined, i.e. it embodies both physical and human capital.

efficiency, rather than by technology (Nishimizu and Page, 1982; Brada, 1989). Thus, research should move towards uncovering the quantitative causality between policies and efficiency.

The remainder of the paper is organised as follows. Section 2 describes the evolution of Yugoslav socialist economic system. Section 3 defines the model, it specifies the exact wedges used, and it discusses the BCA procedure. Section 4 describes the data sources, parameters, and assumptions. Sections 5 and 6 present the results, and the final section provides concluding remarks.

2. History

The strong anti-fascist resistance movement, led by the Communist Party of Yugoslavia (CPY) and its leader, Tito, was able to assert total political power after the end of World War II. CPY, unlike other communist parties in the rest of eastern Europe, was a predominantly “authentic” domestic communist party. It was not installed to power by the Soviet Union and the Red Army as it swathed through the continent and occupied the countries that would later become members of the Warsaw Pact. CPY did not face significant political opposition in the immediate post-war period. Legitimated by the fight against the Axis powers and their domestic collaborators, it was backed, to a larger or smaller extent, by genuine popular support (Pleština, 1992; Lampe, 2000).

The evolution of the socialist economic system in Yugoslavia can be divided into four distinct phases that can be perceived as a gradual move from central planning through market socialism to decentralised planning. The first period, during 1945-51, was characterized by rigid central planning stressing heavy industrialization along the development model set by the Soviet Union. Fixed assets were expropriated, and industrialization was pursued through forced savings that were primarily derived from the agricultural sector, a squeeze on consumption, and the heavy-hand of the government that channelled capital to the manufacturing sector through budget transfers.

The “split” between the Yugoslav president Tito and the Soviet leader Stalin in 1947/8 further intensified the degree of central planning in a desperate bid by the Yugoslav authorities to regain favour with Stalin.⁹ By the end of 1947, Yugoslavia began collectivizing agriculture, while it was not seriously considered before (Woodward, 1995). By 1951, 25 per cent of agricultural holdings were collectivized. The response of the peasants was the usual one, agricultural output collapsed (Stipetić, 2012).

As the rapprochement with the Soviet Union turned impossible while Stalin lived, Yugoslav officials sought to distance themselves from the Soviet Union and its ideology by embarking

⁹ The conflict between Tito and Stalin was, in essence, a power struggle between Yugoslavia and the Soviet Union regarding the influence of these two countries in Albania, Bulgaria and Greece (Rajak, 2011). The result of the split was Yugoslavia’s isolation from the Eastern Bloc and expulsion from the Communist Information Bureau in 1948, with the amassing of Soviet troops at Hungarian border with Yugoslavia.

on a road to a unique version of socialism. This period marks the second phase of development that lasted until 1965. During this period, collectivization and binding output targets were abandoned, and a substantial degree of decision-making power was delegated to enterprises (Prout, 1985). Firms became organised along the principles of self-management.¹⁰ Work councils, supposedly representing the interests of workers, could, in conjunction with the local government, hire and fire the managers of the enterprise and decide, to a degree, on marketing and production processes of an enterprise. Workers, however, did not possess property rights over fixed assets. Instead, fixed assets were treated as “social” property. Nevertheless, workers claimed, to an extent, rights over the income derived from fixed assets.

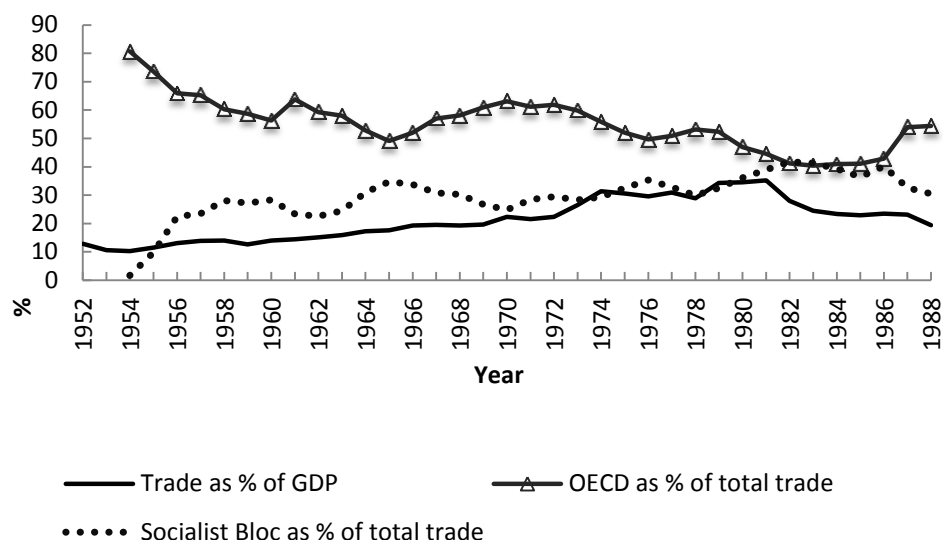
Even though economic decision-making power was substantially decentralized, the Federal authorities still possessed effective control over the economy through the *General Investment Fund*. The creation of the General Investment Fund during the early 1950s replaced direct budget transfers as a main source of investment finance. The Fund centralized capital, which was then allocated to firms that promised highest returns in investment auctions, or to those that were deemed investment worthy, mostly for political reasons (Bičanić, 1973).

During the 1950s, Yugoslavia began gradually opening up, both economically and politically, to the West. Figure 2 illustrates that, throughout the post-war period, Yugoslavia conducted most of its trade with the OECD countries, as opposed to the remainder of Eastern Europe (including the USSR). Until the early 1970s, it conducted generally more than 60 per cent of trade with the OECD. This is quite different to trade patterns among other eastern European countries, since they mostly traded with each other (van Ark, 1996). Furthermore, the path of trade composition in Yugoslavia, compared to the rest of eastern Europe, was a polar opposite. As Yugoslavia gradually normalised relations with the Soviet Bloc, it also gradually traded more with the Soviet Bloc, relative to the OECD countries (figure 2). On the other hand, the rest of eastern Europe gradually increased relative trade with the OECD countries, due to gradual normalisation of relations.

This is not to say that Yugoslavia was particularly *open* per se. Its share of total trade as percentage of gross domestic product (GDP, 1990 Int. GK\$) remained at relatively low levels during the 1950s. Nevertheless, it increased gradually from about 10 to approximately 30 per cent of GDP between the early 1950s and the late 1970s, before decreasing during the 1980s as a consequence of depressed domestic demand for imports. Furthermore, the country became either a member or observer of some international organisations in which the Soviet Bloc did not participate, like the GATT (General Agreement on Tariffs and Trade), OECD (Organisation for Economic Co-operation and Development) and OEEC (Organisation for European Economic Co-operation).

¹⁰ Self-managed firms in Yugoslavia had spawned a great deal of academic interest. It is impossible to provide on these pages a fair and short literature overview on this institutional arrangement. Instead, for theory and Yugoslav practice see Estrin (1983).

Figure 2: Trade as per cent of GDP (1990 Int. GK\$), and composition of trade, 1952-1988.



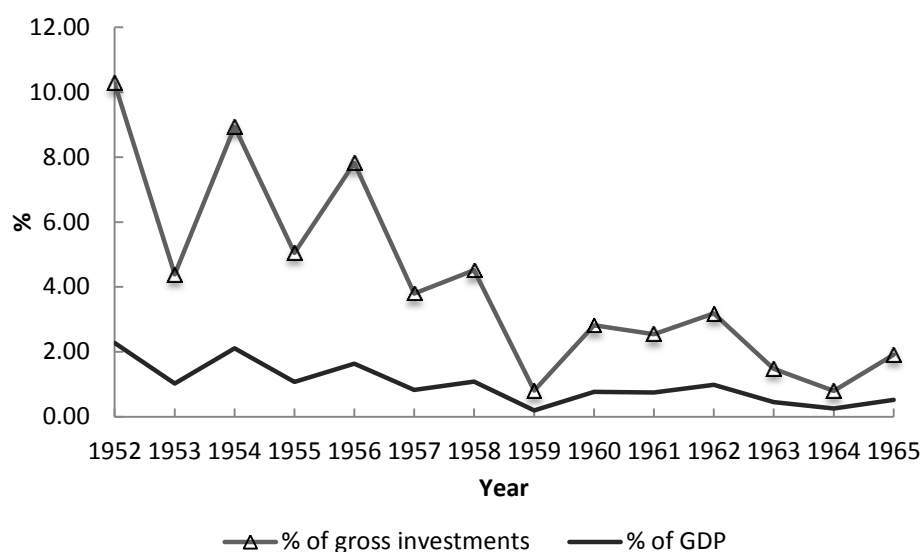
Note: This measure of openness can be considered *real*, since GDP is PPP adjusted. Trade means exports and imports of goods and services. Composition of trade, however, refers to composition of trade in goods, due to data constraints.

Source: Value of trade from *Jugoslavija 1918-1988: statistički godišnjak* (1989), and composition of trade from OECD (1965, 1990).

Opening of Yugoslavia towards the West was rewarded. According to official sources, between 1945 and 1965, Western countries, primarily the United States, provided military and economic aid to Yugoslavia amounting to around 1.6 billion US\$ in current prices.¹¹ Figure displays 3 the magnitude of it. In the early 1950s, western aid amounted to as much as 2 per cent of GDP, and as much as 10 per cent of gross investments. There were no formal economic or political conditions attached to it like in the Marshall Plan – it was not part of it. The aim was to support the country’s efforts to maintain its independence from the Soviet Union (Mocnik, 2008). Nevertheless, the magnitude of foreign aid that Yugoslavia received was lower than the Marshall aid the recipient countries obtained. Eichengreen et al. (1992, p.15) report that Marshall aid averaged 2.5 per cent of the combined national incomes of the recipient countries, and not more than 20 per cent of their capital formation.

¹¹ Data on Western aid beyond 1965 is not reported in official statistics.

Figure 3: Western aid as per cent of GDP and gross investments (1990 Int. GK\$), 1952-1965.



Source: *Jugoslavija 1918-1988: statistički godišnjak* (1989).

The economic reform of 1965 opened the third phase of development that lasted until 1974. It was a heyday of market socialism. Market forces were strengthened through a liberalisation of prices and through allowing enterprises to engage freely in foreign trade. Economic power was further decentralised to the level of enterprises, as work councils were granted rights over the allocation of net income among investments and wages. Furthermore, banks became the primary financial intermediary, as opposed to the General Investment Fund in the previous period. Banks were intended to be the institutional channel through which scarce resources would be allocated to their most productive use. They were not profit-maximizers however. Banks were founded and owned by the firms and the local governments.¹² In effect, banks were cost-minimizers of their clients by providing cheap capital (Prout, 1985; Uvalić, 1992). From the existing literature, it is not clear whether the replacement of the General Investment Fund with banks increased the efficiency with which resource were allocated.

However, it is clear that political interventionism in the process of allocating capital substantially decreased - at least from the federal level. Next to strengthening the role of banks, one of the main aims of the economic reforms of 1965 was to increase the plough-back of profits into the enterprises through decreased taxation of enterprise revenues. The total share of enterprise self-financing of fixed investment increased substantially from 28 per cent in 1965, to over 50 per cent in 1966 (Uvalić, 1992). It remained relatively constant until the 1980s, at around 50 per cent, before increasing to more than 70 per cent during the 1980s, as credit became increasingly difficult to obtain given the debt crisis Yugoslavia entered.

¹² Ownership shares of banks could also theoretically be traded among the firms.

Throughout the period, the state provided less than 5 per cent of total finance for fixed investments, while the remainder of investment finance was provided by banks.

Further decentralization of political and economic power was reinforced by the 1974 constitution, which ushered the last period in Yugoslav economic development that lasted until the collapse of the country in 1991. Economic power was further decentralized to the level of distinct departments within firms. Decentralization of this type, however, did not make the economy more market oriented. On the contrary, it was a period of de-liberalization. The 1974 constitution institutionalized the backlash of political elites against the increasingly independent managers or *technocrats* - to use Yugoslav jargon. The economy became clogged with over-regulation operated by overlapping authorities that formalized the relationship between the departments within a firm, between firms within a sector, between the sectors, and so on. Pejovich (1980) called this a system of *contractual self-management* that led to an increase in transaction costs and efficiency loss in the transmission of market information. Arguably, this inefficiency, coupled with vested interests, slowed down productivity enhancing structural shifts.

3. Methodology

BCA methodology is based on a standard Ramsay-Cass-Koopmans growth model, but including “wedges”. Chari et al. (2007) argue that a large set of dynamic general equilibrium models can be simplified through adding wedges to a prototype neoclassical growth model.

BCA methodology was originally developed with the aim of accounting for business cycle fluctuations. Nevertheless, the method can be applied to study episodes of economic growth. Lahiri and Yi (2009) have used BCA methodology to study the relative economic performance of two Indian states, Lu (2012) investigated the East Asian economies, Chakraborty and Otsu (2013) have analysed the BRIC countries, while Cheremukhin et al. (2014) have relied extensively on BCA insights to study the structural transformation of the Soviet Union during the interwar period.

BCA cannot identify the policies that affect the economy, but rather the evolution of incentives (wedges) that firms and households face. The four wedges used in this paper are the channels through which policies affect growth. Taken together, they drive economic growth, and match the data. The *labour wedge* is related to the structure of incentives that determine the supply of labour or work effort. A rising labour wedge can be interpreted as rising return on labour that stimulates the provision of labour. The labour wedge is often taken to be synonymous with a tax on labour. As such, a deteriorating labour wedge can be interpreted as a distortion arising due to increased taxation of labour supply. The *capital wedge* is related to incentives that determine savings and investments, both in physical and human capital. An increasing capital wedge can be interpreted as an increasing return on capital that stimulates savings and investments. Analogous to the labour wedge, a capital wedge is often taken to be synonymous with a tax on capital. Consequently, a deteriorating capital wedge can be interpreted as a distortion arising due to increased taxation of capital.

The *income wedge* embodies aggregate demand shocks stemming from government expenditure and net foreign demand for domestically produced good and services. Finally, the *efficiency wedge*, or simply TFP, measures the efficiency with which inputs are transformed into output.

The main limitation of BCA is that the measured wedges do not interact with each other. Furthermore, in order to understand the exact incentives that, say, increase the return on the supply of labour, a researcher should specify a more detailed model. Thus, as Chari et al. (2007) argue, BCA, first and foremost, should be perceived as a diagnostic tool that can inform a construction of a more sophisticated model.

3.1. *Prototype Ramsay-Cass-Koopmans model*

The infinitively lived representative household derives utility at period t from per capita consumption (c_t) and leisure ($1 - l_t$):

$$\sum_{t=0}^{\infty} \beta^t N_t [\log(c_t) + \phi \log(1 - l_t)] \quad (1)$$

where N_t denotes the working age population, and ϕ is the coefficient for leisure. The household discounts consumption and leisure with the factor β since, all else given, the household prefers to consume goods in the current period as opposed to consume goods in subsequent periods, and prefers to consume leisure in the current period as opposed to consume leisure in subsequent periods.

The representative firm, and therefore the aggregate economy, is characterised by the Cobb-Douglas production function as in Hall and Jones (1999):

$$Y_t = K_t^\theta (x_t h_t L_t)^{1-\theta} \quad (2)$$

where Y_t denotes output, which is a function physical capital (K_t), labour augmenting technological progress (x_t), human capital per worker (h_t), and labour (L_t). θ is the elasticity of output with respect to physical capital. Assuming constant returns scale, $1-\theta$ is the elasticity of output with respect to labour augmented by quality ($x_t h_t L_t$). All the components of output are determined outside the model, except physical capital, which is characterised by the usual law of motion:

$$K_{t+1} = (1 - \delta)K_t + I_t \quad (3)$$

where δ is the depreciation rate, and I_t denotes gross investments.

In addition to the production function in equation 2, the equilibrium of a prototype neoclassical growth model is characterised by the following four equations:

$$\frac{(1 - \theta) y_t}{c_t} \frac{y_t}{l_t} = \frac{\phi}{(1 - l_t)} \quad (4)$$

$$\frac{(1 + \gamma)c_{t+1}}{c_t\beta} = 1 + \theta \frac{y_{t+1}}{k_{t+1}} - \delta \quad (5)$$

$$c_t + i_t = y_t \quad (6)$$

$$(1 + \gamma)(1 + v_t)k_{t+1} = (1 - \delta)k_t + i_t \quad (7)$$

where Y_t , I_t , and K_t are expressed in per capita terms (per working age person) as y_t , i_t , and k_t . γ is the growth rate of labour augmenting technological progress, and v_t is the growth rate of the working age population. Equation 4 determines the equilibrium condition for the supply of labour. Equation 5 defines the growth rate of consumption. Equation 6 describes the resource constraint of the economy, and equation 7 specifies the growth rate of physical capital.

3.2. Wedges

The underlying logic of BCA rests on the observation that, in real economies, the terms on the sides of equation 2, and of equations 4-6, are generally different. These differences are coined as wedges. These wedges measure the discrepancy between the model predictions and the data observations. They measure distortions that economic agents face.

The efficiency wedge, or TFP, measures the efficiency with which inputs are transformed into output. As in real business cycle models, the TFP wedge is measured as the deviation around the trend growth rate of labour-augmenting technological progress (γ). Formally, it is based on equation 2 and is defined as:

$$z_t = \frac{y_t}{k_t^\theta (x_t h_t l_t)^{1-\theta}} \quad (8)$$

The labour wedge measure the discrepancy between the marginal rate of substitution of consumption for leisure, and the marginal product of labour. Incentives that drive the supply of labour to deviate from the level implied by equation 4 are reflected in the labour wedge ($1 - \tau_{l,t}$):

$$\frac{\phi c_t}{1 - l_t} = (1 - \theta) \frac{y_t}{l_t} (1 - \tau_{l,t}) \quad (9)$$

The capital wedge measures the frictions that distort the inter-temporal Euler equation, which specifies the trade-off between current and future consumption. Incentives that drive investments to deviate from the level implied by equation 5 are reflected in the capital wedge ($1 - \tau_{k,t+1}$):

$$\frac{(1 + \gamma)c_{t+1}}{c_t\beta} + \delta - 1 = \theta \frac{y_{t+1}}{k_{t+1}} (1 - \tau_{k,t+1}) \quad (10)$$

The income wedge measures the discrepancy between output and domestic “private” demand – composed of consumption and investments – in equation 6. This discrepancy measures the expenditure gap in order for the resource constraint to hold. The income wedge ($\tau_{i,t}$) captures

aggregate demand shocks stemming from government expenditure and net foreign demand for domestically produced goods and services:

$$y_t - c_t - i_t = y_t \tau_{i,t} \quad (11)$$

3.3. Procedure

BCA methodology is composed of two steps. In the first step, the wedges are calculated from the data. Presenting the path of wedges over time is insightful in its own right, as it indicates the evolution of incentives over time. In the second step, each estimated wedge is inserted back into the prototype model, one at a time, or in combinations, in order to gauge the quantitative significance of specific wedges in driving the dynamics of economic growth in excess of γ .¹³

4. Data, calibration, and assumptions

4.1. Output and inputs

The period of analysis is between 1952 and 1990. The data this paper relies on is derived from both official and alternative sources, with the aim of maximising the quality of data. All *value* figures are converted into 1990 International Geary-Khamis dollars.

Net Material Product, or *Social Product* (SP) in case of Yugoslavia, was the official indicator used to monitor economic activity in socialist countries. SP is conceptually equivalent to GDP. The two measures, however, are calculated differently and yield different results. Official output series of socialist countries are inflated due to index number problems (Gerschenkron, 1947), distorted prices (Staller, 1986), and perhaps outright fabrication by enterprises in order to maximise the allocation of scarce resources within a shortage economy. Due to these reasons, I use alternative GDP series from Maddison (2010). Maddison (2010) has used the output series created by a group of Western scholars published in a series of papers within the *Research Project on National Income in East Central Europe*, and led by Thad P. Alton from Columbia University. They relied on physical output indicators published in official sources that they transformed into GNP at factor cost. They consistently applied western national accounting standards (*System of National Accounts*), making their estimates comparable to income series of market economies. They essentially relied on the method developed by Bergson (1953) to estimate Soviet national income. Their publications that cover the whole period under analysis include Alton (1970), and Alton et al. (1992).¹⁴

¹³ Due to γ , the model distinguishes between trend growth, and the fluctuations of growth around the trend as in real business cycle models (balanced growth path).

¹⁴ Consumption series, however, are taken from official sources, since alternative long-run series are unavailable (*Statistički godišnjak SFR Jugoslavije*, 1991).

Turning to population data, the size of the working age population (those that are aged between 15 and 64 years) is taken from official sources.¹⁵ Annual employment figures of the “social sector” (incorporating workers that are in formal paid employment) are again taken from official sources.¹⁶ Workers employed in private farming are reported only in population census years (1948, 1953, 1961, 1971, 1981, 1991).¹⁷ For the remaining years of the analysis, agricultural labour has been estimated through a cubic interpolation. Turning to the final population component, hours worked per average worker are defined as *effective* hours worked, e.g. excluding sick leave but including overtime.¹⁸ Finally, total annual labour input (total hours worked) is de-trended by 3600, since the representative household spends a portion of time satisfying biological necessities (like sleeping).

Human capital is initially approximated by average years of schooling of the working age population from Barro and Lee (2013). However, they do not report average years of schooling for Yugoslavia. Instead, I assume their estimate for Serbia is representative of Yugoslavia. The Socialist Republic of Serbia was a component of the Socialist *Federal* Republic of Yugoslavia. Serbia was the largest Yugoslav republic in terms of population, output, and territory, and therefore determined to a large extent the *mean* and *median* of Yugoslavia, across a range of development indicators.¹⁹ I prefer to use Barro and Lee (2013) dataset, as opposed to independently estimating average years of schooling of Yugoslavs, due to their refined interpolation method for the in-between population census years.

Average years of schooling are turned into *mincerian* human capital through adjusting for the returns to education as in Hall and Jones (1999), which is assumed to be piecewise linear. The return to education under 4 years of schooling is taken to be 13.4 per cent, between 4 and 8 years of schooling it is taken to be 10.1 per cent, and above 8 years of schooling it is taken to be 6.8 per cent.

The most problematic data series needed for the analysis is gross investments and physical capital stock. Similar to output series, gross investments were likely inflated due to price distortions (prices of producer goods were set above world prices, while prices of agricultural goods were set below world prices), and perhaps outright fabrication from enterprises. Nevertheless, while alternative output series have been produced in response to the criticism of official output series, by contrast, there are no existing alternative investment series. As such, I am forced to rely on official sources.²⁰ Nevertheless, I exclude an investment category called “other”. I have decided to omit this category since it includes expenditure on product research and training of personnel, which should not be considered as part of physical capital. Furthermore, it included “automatic” revaluation of inventory stock, while Madžar (1985)

¹⁵ *Demografska Statistika* (various years).

¹⁶ *Statistički godišnjak SFR Jugoslavije* (1991).

¹⁷ The 1991 Yugoslav population census was conducted, but not published due to the disintegration of the country. As such, I take the agricultural labour data from the successor states of Yugoslavia from International Labour Organisation..

¹⁸ *Statistički godišnjak SFR Jugoslavije* (various years).

¹⁹ For example, in 1991 Serbia formed roughly 40 per cent of Yugoslav total population.

²⁰ *Investicije u osnovna sredstva SFR Jugoslavije socijalističkih autonomnih pokrajina 1952-1981, u cenema 1972 (1983) and Investicije (1982-89)*.

reported that, in the presence of high inflation of the 1970 and the 1980s, these values have been (grossly) inflated.

Capital stock series have been initialised with official estimates concerning 1952.²¹ If the initial level of capital stock is over-estimated, which is probable, I would underestimate the contribution of capital deepening to growth due to the effect of a high base. Nevertheless, this issue should not distort one of my main results. That is, if the actual initial level of capital stock is lower than the one used in this paper, the finding that TFP gradually increased in importance as a driver of growth should not be (significantly) affected since, over a sufficiently long-horizon, the initial value of the capital stock is un-important (Caselli, 2005).

4.2. Parameters

Turning to the parameters, the discount factor (β) is assumed to be 0.95, and the coefficient for leisure (ϕ) is taken to be 2. Similar assumptions are made in papers that focus on countries at a similar level of development and growth trajectory (Lu, 2012; Cheremukhin et al., 2014). Alternatively, it is possible to estimate these parameters from the data, but one would have to make arbitrary assumptions like, for example, that the wedges are equal to 1.²² Assuming perfectly competitive markets, the elasticity of output with respect to capital (θ) is synonymous with the capital share of income. I assume that θ is 0.4, similar to the often estimated capital share of income in socialist countries (Easterly and Fischer, 1995). Furthermore, Kukić (2015) had estimated the capital share of income for Yugoslavia from its national accounts, he found it is 0.43. The remaining parameters are estimated directly from the data. To name a few; population growth rate (v_t) is time varying, and is on average 1.1 per cent per annum. The growth rate of labour-augmenting technological progress (γ) is 0.9 per cent (constant), which is estimated as the average annual growth rate of labour-augmenting technological progress during 1952-89.²³ The depreciation rate (δ) is 5.46 per cent. Depreciation rate is chosen as such in order to ensure the modelled capital stock matches the 1990 capital stock provided by data, given the initial level of capital stock in 1952.

4.3. Assumptions

Additional assumptions are needed to terminate the model. 1990 is taken to be the terminal period of the wedges. That is, with 1990 the model takes the form of the prototype Ramsay-Cass-Koopmans growth model. For this reason, I exclude 1990 from my analysis.

In regards to more fundamental assumptions, profit-maximisation behaviour by firms implied by the model is a poor description of firm behaviour within a socialist economy.

²¹ *Osnovna sredstva privrede društvenog sektora SFR Jugoslavije, socijalističkih republika I socijalističkih autonomnih pokrajina, 1952-1981, u cenama 1972* (1983).

²² I had indeed conducted this exercise, by holding the level of wedges at 1 during the first 5 year of analysis. The level of the labour wedge changes significantly (due to twice as high ϕ , compared to the baseline assumption) which, as elaborated later in section 5, further reinforces the point that the level of wedges should be disregarded from interpretation. Nevertheless, the growth trend of wedges is robust to a change in ϕ and β .

²³ I exclude 1990 due to the disintegration of the country. Furthermore, as elaborated in section 4.3, 1990 is just the termination year needed to close the model.

Nevertheless, a planned economy can be perceived as a heavily distorted version (embodied by wedges) of a perfectly competitive market-based economy as defined by the prototype model.

Turning to the production function, the Cobb-Douglas assumption of unit substitution between capital and labour might be wrong. In an influential paper, Weitzman (1970) argued that the Soviet economy was better represented by constant elasticity of substitution (CES) between capital and labour that is (significantly) below one. Easterly and Fischer (1995) later argued the same, using updated data. Sapir (1980) had found almost identical results for Yugoslavia, where from the mid-1960s labour constraints retarded economic growth.

CES between capital and labour that is below unity could provide an elegant explanation for both the success and failure episodes of Yugoslavia. An economy characterized by it should run into acute diminishing returns on capital as labour becomes increasingly scarce, leading to a sharp slowdown in economic growth. Under this line of argumentation, Cobb-Douglas production function overestimates the contribution of capital deepening to growth since it fails to register the true extent of diminishing returns on capital, while it commensurately under-estimates the contribution of TFP growth.

There are at least four arguments that could be raised against this hypothesis. First, Yugoslav economic growth was high and persistent for three decades and then it stopped, rather than entering a significant growth slowdown previously. Second, all Yugoslav regions stagnated in the 1980s, notwithstanding the differences in their economic structures and level of under-employed labour (embodying outright unemployment and agricultural surplus labour). Third, due to Yugoslavia's isolation from the Soviet Bloc in the late 1940s and the early 1950s, it relied on importing Western technology (implied by trade composition in figure 2). It seems unclear why the country would then face a fundamentally different production function compared to OECD countries. Fourth, CES derived is a product of statistics. Allen (2003) attempts to refute Weitzman's hypothesis by arguing capital was massively wasted in the Soviet Union, which implies negative TFP growth during the 1980s.

For these reasons, Cobb-Douglas production function seems as an appropriate form of a CES production function with which to characterise Yugoslavia.²⁴ Nevertheless, if CES between capital and labour were indeed below one, this would only serve to reinforce my results. The finding concerning the increasing importance of TFP in sustaining growth would be reinforced. The deterioration of the labour wedge since the mid 1960s would be even more pronounced, and the labour wedge would be even more significant in driving the deterioration of Yugoslav economic performance during the 1980s.

²⁴ Kukić (2015) describes other assumptions of the production function that might seem rigid in the case of Yugoslavia, like the assumption of perfectly competitive markets.

5. Results: The evolution and interpretation of wedges

Figure 4 depicts the evolution of Yugoslav wedges. It also depicts the U.S. wedges for contextual purposes. Before presenting the analysis, it is important to make two remarks in regards to the interpretation of wedges. First, the *level* of wedges should be disregarded from interpretation, since the initial levels can be sensitive to the choice of parameters. As such, the evolution of wedges is the cornerstone of the analysis, since the growth rates of wedges are robust to different assumptions. Second, it is meaningless to compare the levels of Yugoslav and U.S. wedges for the aforementioned reason. It is furthermore meaningless to compare the levels of wedges since the TFP, capital wedge, and labour wedge are expressed relative to their own frictionless prototype model value.

5.1. TFP

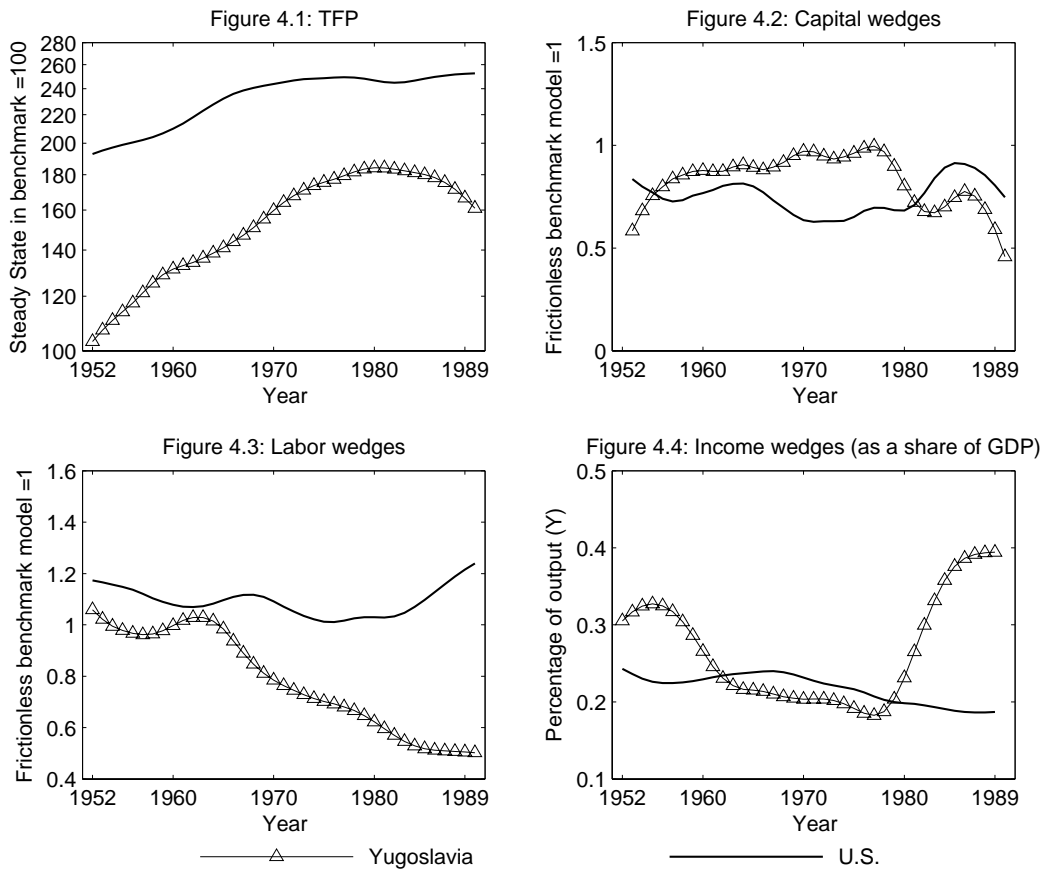
Turning to the analysis, between 1952 and 1989 Yugoslav TFP grew by 1.3 per cent on an annual basis (figure 4.1). Yugoslav TFP grew faster than the U.S. TFP, implying convergence of Yugoslav TFP to U.S. levels. The evolution of Yugoslav TFP can be clearly segmented into two periods – before and after the second oil shock in 1979. Before 1979, Yugoslav TFP grew rapidly by 2.1 per cent per annum, while afterwards, it decreased by 0.7 per cent per annum. How can one account for the evolution of Yugoslav TFP?

In regards to the period before 1979, the literature provides a set of viable interpretations underlying the increase of TFP. Nishimizu and Page (1982) had analysed Yugoslav TFP between 1965 and 1978. They had decomposed it into technological progress and technical efficiency. They found that the evolution of TFP was driven by technical efficiency, rather than technological progress. This conforms to Hsieh and Klenow (2009), who argue that the efficiency of resource allocation is a major component and driver of TFP.

Improvements in resource allocation, in the early stages of growth, might have been driven by reconstruction dynamics in the wake of destruction caused by World War II (Vonyó, 2008). Eichengreen (2008) reports that losses of GDP between 1938 and 1946 were higher in eastern Europe than in western Europe. He also reports that the highest losses of GDP among the Eastern European countries were experienced in Poland and in Yugoslavia –amounting to around 50 per cent of GDP. Nevertheless, pre-war GDP levels were reached by 1950. Since reconstruction dynamics are arguably intrinsically short, further explanations are required.

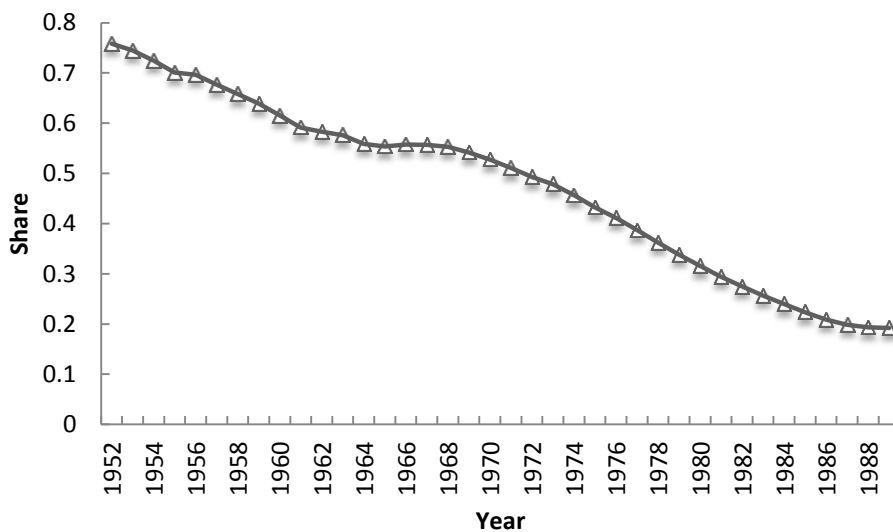
Vollrath (2009) argues that that the misallocation of resources between agriculture and non-agriculture can account for approximately one-third of the variation in income levels across countries. Yugoslavia was overwhelmingly agricultural in the aftermath of World War II, but it experienced rapid structural change during the post-war period – analogues to the experience of southern and other eastern European countries. As such, reallocation of resources from low productivity agriculture to high productivity manufacturing and modern services certainly stimulated TFP. As shown in figure 6, agricultural workers formed 74 per cent of total workforce in 1952. By 1989, agricultural workers formed 19 per cent of total

Figure 4: Yugoslav and U.S. wedges, 1952-89



Note: Business cycles have been cycled out using the Hodrick-Prescott filter (smoothing parameter = 6.25). No technological growth rate is imposed ($\gamma = 0$), rendering TFP growth comparable to standard growth accounting exercises.

Figure 5: Share of agricultural workers in total workforce in Yugoslavia, 1952-89



workforce. Indeed, Kukić (2015) finds that efficiency gains associated with structural modernisation can account for a quarter of conventionally measured TFP in Yugoslavia.

However, it is important to note that, while potential improvements in the sectoral allocation of resources can certainly account for a fraction of TFP, they cannot explain the path or acceleration of TFP. If I focus exclusively on the non-agricultural sector of the economy and exclude the effect of structural change by definition, I still find that TFP increased in importance with the passage of time (see the appendix for details). As such, further explanations underpinning the evolution of TFP are required.

Trade might, beyond boosting aggregate demand, indirectly impact output through TFP (Alcalá and Ciccone, 2004). Yugoslavia became a member of GATT in 1966, which coincides with the acceleration of TFP contribution to economic growth. The gradual integration of Yugoslavia into global markets (implied by figure 2) might have stimulated TFP through a more efficient allocation of resources, as long as the country specialised in the production of goods and services according to its comparative advantage. The development of tourism along the Adriatic coast is an illuminating example that Yugoslavia, to an extent, did specialise in the production of goods and services according to its comparative advantage. Allcock (1986) reports that by 1980, Yugoslavia became the fifth largest tourist destination in Europe (in terms of volume or headcount). Tourism was furthermore a major source of foreign exchange earnings. It rose from being the 10th most important sector in generating foreign exchange in 1960, to being the second most important sector in generating foreign exchange by the 1980s.

Turning to the 1980s, the fall in TFP - analogous to the experience of Latin America and the remainder of Eastern Europe – is related to a deep crisis that was instigated by the second oil shock in 1979. Recessions are typically characterised by decreased capacity utilisation of both capital and labour which, if not explicitly accounted for, are reflected in a decrease in TFP.

During the 1970s, with abundance of cheap capital in global financial markets brought about by oil extracting countries, Yugoslavia entered a period of borrowing frenzy to finance domestic investments and consumption. Yugoslav external debt level increased by nearly 8 times during this period, from 2.3 billion US\$ in 1970 to 18.4 billion US\$ by 1980 (in current prices), rendering the country vulnerable to external shocks.²⁵

External shocks came in two closely related forms. First, the 1979 Iranian Revolution rattled the global energy markets, evident in the doubling of oil prices between 1979 and 1980 (Hamilton, 2013). Yugoslavia was especially vulnerable to energy shocks since it was using 2-3 times as much energy per unit of output as the OECD countries during the early 1980s (Dyker, 1990). Energy intensity of Yugoslav industrial production actually grew by 1 per cent between 1973 and 1982, while on average it decreased by approximately 30 per cent in the largest OECD countries during the same period (Dyker, 1990). The second shock was brought about by increased interest rates in creditor nations designed to reduce inflation, which increased Yugoslav debt-servicing costs.

²⁵ *Jugoslavija 1918-1988: statistički godišnjak* (1989).

The two combined effects led to a sharp increase in the current account deficit, from 1.3 billion US\$ in 1978 to 3.7 billion US\$ in 1979 (in current prices) (Dyker, 1990).²⁶ With constrained export demand, the only way to avoid a crushing balance-of-payments crisis was to limit other components of aggregate demand, like imports, consumption, and investments. From 1979 to 1983, severe austerity measures resulted in a collapse of real personal incomes by approximately 30 per cent, and a precipitous fall in the investment to output ratio (figure 1.3), leading to a collapse of aggregate demand that did not recover during the remainder of the 1980s.²⁷

5.2. *Capital wedge*

The Yugoslav capital wedge grew in a similar direction during similar time as TFP (figure 4.2). The capital wedge grew by 1.2 per cent per annum during 1952-79, while during 1979-89 it decreased by 0.6 per cent per annum. In contrast, the U.S. capital wedge does not exhibit any obvious trend during the sample period. Policies designed to stimulate the accumulation of capital in planned economies are well established (see section 2). Until 1979, they obviously succeeded in increasing the return on capital, stimulating the accumulation of capital. After the 1979 oil shock, the macroeconomic instability of Yugoslavia characterised by high and persistent inflation (Frenkel and Taylor, 1993), had likely decreased the real return on capital due to increased un-certainty, and increased the preference to consume in the current period as opposed to consume in future periods. Furthermore, the economy had certainly, to a larger or smaller extent, ran into diminishing returns on capital.

5.3. *Labour wedge*

Yugoslav labour wedge was relatively stable until the mid-1960s (figure 4.3). Subsequently, it had steadily decreased. Over the whole sample period, it decreased by 2 per cent per annum. The U.S. labour wedge was relatively stable during the whole period, but seems to have increased since the early 1980s.

In so far that planned economies were characterized by embedded in-efficiencies that had furthermore increased over time, they are then reflected in the deterioration of the labour wedge. This means that the incentive or ability of households to supply labour deteriorated over time.

This finding is similar to the argument made by Weitzman (1970), Sapir (1980), and Easterly and Fischer (1995), who argued that labour constraints retarded economic growth. The analytic foundation on which this common finding is based is quite different. They aforementioned authors found it on the basis of low CES between capital and labour (as a reminder, see section 4.3), while in this paper the deterioration of the incentive or ability to

²⁶ The initial response of Yugoslav authorities to a current-account crisis was to do nothing. The death of Tito in 1980 exposed complete political vacuum within the League of Communist of Yugoslavia (LCY). The country was subsequently ran by an ineffectual presidency containing nine members – one from each Republic and Autonomous Region and the leader of the LCY. Members of the presidency rotated on the leading position on an annual basis.

²⁷ Austerity measures of the early 1980s included rationing of key consumer goods like petrol, sugar, detergent, and cooking oil (Dyker, 1990).

supply labour hours is due to a discrepancy between the marginal rate of substitution between consumption and leisure, and the marginal product of labour.

In order to interpret the evolution of the labour wedge, it is useful to refer back to figure 1.4 that depicts the deterioration of hours worked per capita. Hall (1997) argues that the labour wedge reflects frictions that lead households to spend a long time on non-market activities. In Yugoslavia, the deterioration of hours worked per capita was a consequence of two proximate factors; a) total hours worked in the economy were stagnant over the whole sample period (figure 6.1), while b) the working age population steadily increased (figure 6.2).

The slightly negative growth of total hours worked seems unusual, but can be readily explained. Between 1952 and 1989, the amount of yearly hours an average labourer spent working decreased by approximately 25 per cent. The yearly hours supplied per worker embarked on a steady decline since the early 1960s, which coincides with the fall in total hours worked. The increased amount of time devoted to leisure is similar to trends in other European countries during the post-war period (Huberman and Minns, 2007).

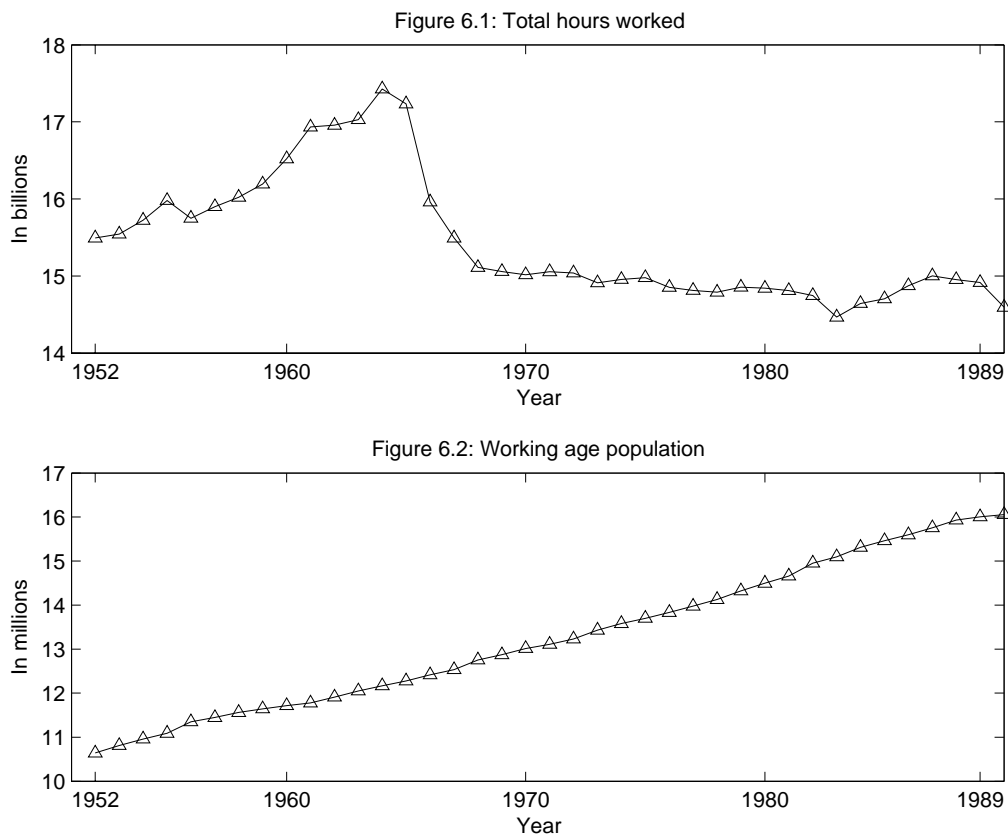
In Yugoslavia, the impact of the increased amount of time devoted to leisure was buttressed by the weak growth of total number of workers, leading to overall stagnant work effort. In 1989, the total number of workers was barely 15 per cent higher than in 1952, while the working age population increased by 50 per cent during the same period. The miss-match between these two figures is reflected in increasing unemployment rate. Unlike in other planned economies, unemployment in Yugoslavia was, to an extent, open. To refer back to the interpretation of the labour wedge suggested by Hall (1997), it might be the case that the deteriorating Yugoslav labour wedge reflected frictions such as long job searches, mirrored in the increasing unemployment rate. In Yugoslavia, the official unemployment rate steadily increased from an average 8.2 per cent during 1967-75 to an average 12.6 per cent during 1976-87 (Kraft, 1992). The open and high unemployment rate was a structural feature of the economy, likely caused by a bias towards the development of capital-intensive industries (Sapir, 1980; Uvalić, 1992; Woodward, 1995).

Furthermore the miss-match between the number of workers and the working age population was buttressed by migration patterns of Yugoslav labour. With the elimination of travel restrictions during the 1960s, approximately 10 per cent of the labour force emigrated to Western Europe in search for higher wages - primarily to Germany as “guest workers” - draining the domestic supply of labour (Popis stanovništva, 1971; 1981). To speculate, it might be the case that spouses of migrants that remained in Yugoslavia remained out of the labour force, deteriorating the labour wedge. In any case, with the slow-down of economic growth in Western countries during the 1970s and the 1980s, the external vent for surplus labour was diminished, increasing domestic unemployment.

Turning to another interpretation of the labour wedge, Chari et al. (2007) suggest that, during the U.S. Great Depression, the labour wedge reflected frictions caused by monetary contraction (deflation) and trade unions (nominal wage rigidity). In Yugoslavia during the 1980s, money supply grew fast, but prices grew even faster, causing the real money balances

to halve (Bradley and Smith, 1991). In regards to the wage bargaining power of workers, much has been written about labour-managed firms and the intrinsic theoretical tendency of such firms to under-invest in order to release funds with which to pay high wages (see e.g. Estrin, 1983).

Figure 6: Yugoslav labour data, 1952-90



Labour strike activity in Yugoslavia provides interesting insights in regards to labour frictions that were potentially caused by the excessive power of workers. Labour strikes were implicitly illegal in Yugoslavia (Stanojević, 2003). As such, information on their frequency is scant. Furthermore, within a labour-managed economy, strikes were awkward since, if workers managed the workplace, how can one strike against oneself? Nevertheless, the first reported labour strike occurred in 1958, and Table 1 reports the available data on labour unrest since 1958. As measured by the frequency of strikes (number of strikes per million members of the workforce), it appears that labour strike activity had increased from 1958 until 1978, potentially contributing to the deterioration of the labour wedge. Nevertheless, there are not enough data observations to be certain of this. Between 1980 and 1982, labour unrest had actually decreased when measured by the frequency of strikes and the number of workers involved. However, the media reporting of labour unrest had actually increased,

potentially indicating the growing influence of labour strikes on the public discourse. After 1982, labour unrest had drastically increased by all measures reported in table 1. Stanojević (2003) argues that, in comparative terms, the frequency of strikes in Yugoslavia during the 1980s was high, if not extremely high²⁸.

Table 1: Labour unrest in Yugoslavia, 1958-89

	Frequency of strikes*	Number of strikes	Number of workers on strike	Media reports of strikes
1958	2.8	n/a	n/a	n/a
1978	30	n/a	n/a	n/a
1980	62	235	13,504	3
1981	47	216	13,507	8
1982	18	174	10,997	24
1983	96	336	21,776	36
1984	100	393	29,031	86
1985	104	696	60,062	158
1986	163	851	88,860	195
1987	227	1685	288,686	734
1988	228	n/a	n/a	320
1989	232	n/a	n/a	n/a

Note: *1980 to 1989 shows data for Slovenia, a member republic of Yugoslavia.

Sources: Stanojević (2003) for the frequency of strikes; Jovanov (1989) for the number of strikes and the number of workers involved; Lowinger (2009) for media reporting of strikes

5.4. Income wedge

The evolution of the income wedge (figure 4.4), although not its level, has been shaped by net exports. Net exports have particularly deteriorated during the 1970s, driving the deteriorating of the income wedge. In 1969, I find that imports exceeded exports by 1 percentage point of GDP, while in 1979, imports exceeded exports by 7 percentage points of GDP. As the country entered the debt crisis, depressed domestic demand limited imports. Furthermore, Dyker (1990) argues that imports, particularly of consumer goods, were deliberately decreased in order to avoid a crushing balance of payments crisis. Consequently, the current account position of Yugoslavia improved since, for the first time in its history, export exceeded imports by 1983, driving the increase of the income wedge.²⁹

²⁸ Lowinger (2009) reports that, during the 1980s, 93 per cent of labour unrest was due to wage demands.

²⁹ In 1986, as a record year, exports exceeded imports by 1.6 percentage points of GDP.

6. Results: The contribution of wedges to economic growth

I present the contribution of wedges to economic growth through several ways. Table 2 displays the contribution of specific wedges to the average annual growth rate of each macroeconomic variable of interest (output per working age person, labour, and the capital to labour ratio). The contribution of each specific wedge is isolated by holding constant the value of all the remaining wedges to their average 1952-7 levels. The contribution of each specific wedge reveals how much a variable of interest would have grown solely because of the evolution of that specific wedge.

During the 1950s, TFP growth is able to replicate 90 per cent of economic growth (first column of table 2). In the 1960s, the ability of TFP to replicate economic growth decreases to 79 per cent, before increasing to 127 per cent during the 1970s. Thus, in the 1970s economic growth would have been higher were all the other wedges fixed. In the 1980s, TFP would have made economic growth positive (by 0.5 per cent), were it not for the evolution of the other wedges. The increasing importance of TFP in sustaining economic growth is reflected in the increasing importance of TFP in driving the growth of the capital to labour ratio (third column of table 2). Therefore, TFP increased the steady state level of output, while convergence towards the steady-state was facilitated through an increase in the capital to output ratio (or alternatively the investment to output ratio).

The contributions of the capital and the income wedge to economic growth were generally of similar magnitude, but they sustained economic growth at different periods. In the 1970s, the income wedge stimulated output strongly, while the contribution of the capital wedge was nil. The income wedge stimulated growth through, initially, increased relative government expenditure. Subsequently, labour wedge stimulated growth through increased net foreign demand for domestically produced goods and services. Increased net foreign demand indirectly stimulated growth through increased demand for labour, but also the capital to labour ratio. In the 1980s on the other hand, the capital wedge stimulated output through stimulating the supply of labour (second column of table 2), while the contribution of the income wedge was nil.

The labour wedge was of small importance in stimulating output during the 1950s and the 1960s. The labour wedge did not make any contribution to economic growth in the 1970s, and it drove negative economic growth during the 1980s. Throughout the sample period, the labour wedge was a major constraint on growth through decreasing the supply of labour.

Segmenting periods is a useful quantitative summary of results, but can obfuscate the dynamic dimension in regards to the contribution of wedges to economic growth. The remainder of this section seeks to reinforce the two main findings of this paper. First, that TFP became more important over time in sustaining growth. Second, that the labour wedge was a major constraint on growth.

Table 2: The contribution of wedges, 1952-89

	Output per working age person	Labour	Capital to labour ratio
<i>1952-1960</i>			
<i>Average annual Growth rate</i>	5.6	-1.3	4.6
TFP	5.0 (90%)	0.5 (38%)	1.6 (35%)
Capital wedge	2.0 (36%)	-1.6 (-123%)	5.6 (122%)
Labour wedge	0.3 (5%)	-6.6 (-508%)	5.2 (113%)
Income wedge	1.32 (24%)	-2.1 (-162%)	4.2 (91%)
<i>1960-1970</i>			
<i>Average annual Growth rate</i>	3.3	-7.1	8.3
TFP	2.6 (79%)	-3.9 (-55%)	4.1 (49%)
Capital wedge	1.2 (36%)	2.0 (28%)	3.1 (37%)
Labour wedge	0.2 (6%)	-6.2 (-87%)	3.8 (46%)
Income wedge	1.5 (45%)	1.0 (14%)	8.2 (99%)
<i>1970-1980</i>			
<i>Average annual Growth rate</i>	3.7	-3.6	6.3
TFP	4.7 (127%)	0.0 (0%)	5.5 (87%)
Capital wedge	0.0 (0%)	-4.4 (-122%)	1.3 (21%)
Labour wedge	0.0 (0%)	-4.4 (-122%)	1.8 (29%)
Income wedge	3.2 (86%)	6.3 (175%)	2.4 (38%)
<i>1980-1989</i>			
<i>Average annual Growth rate</i>	-1.2	-2.5	1.0
TFP	0.5 (38%)	-2.2 (-88%)	4.6 (460%)
Capital wedge	1.0 (83%)	2.4 (96%)	-0.9 (-90%)
Labour wedge	-0.9 (-75%)	-3.9 (-156%)	0.4 (40%)
Income wedge	0.0 (0%)	-0.8 (-32%)	-0.7 (-70%)

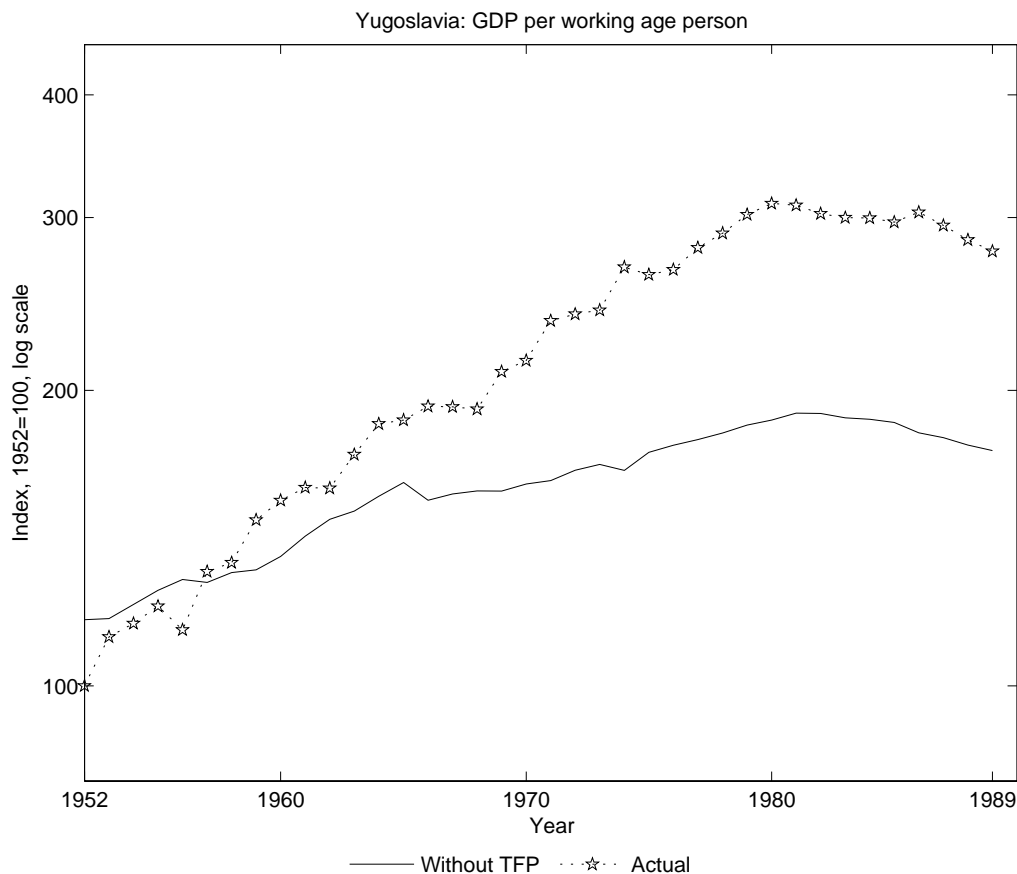
Notes: The number outside the brackets is the average detrended (by $\gamma=0.009$) annual growth rate of a variable. The annual growth rate of a specific wedge depicts the rate of annual growth a macroeconomic variable (e.g. output per working age person) would have attained because of that specific wedge, conditional on the other wedges remaining fixed. The number within the bracket contains the percentage of growth of a specific variable a specific wedge is capable of replicating.

Figure 7 plots the evolution of output per working age person determined by all the wedges except TFP (in figure 7 line named “without TFP”), in relation to the actual evolution of output per working age person. Hence, the line without TFP depicts simulated economic growth were TFP growth absent. The gap between the two plotted lines is thus due to TFP, and the plotted figure gauges the relative significance of TFP in stimulating economic growth versus all the other wedges.

Figure 7 reveals that in the early stages of growth (approximately until the early 1960s), the combined capital, labour and income wedge are able to replicate most of economic growth, since the path of the actual output and the counterfactual output (again, given by all the wedges except TFP) track each other closely. The gap between the two lines widens over time, meaning that TFP became more important in sustaining growth with the passage of

time. This finding is similar to what Lu (2012) finds for the East Asian economies. She argues that capital accumulation was the main driver of economic growth in the early stages of development, while TFP was the main driver of economic growth in the latter stages of development during her sample period (1966-2006).

Figure 7: The actual evolution of GDP per capita versus the counterfactual evolution of it (without TFP), 1952-89



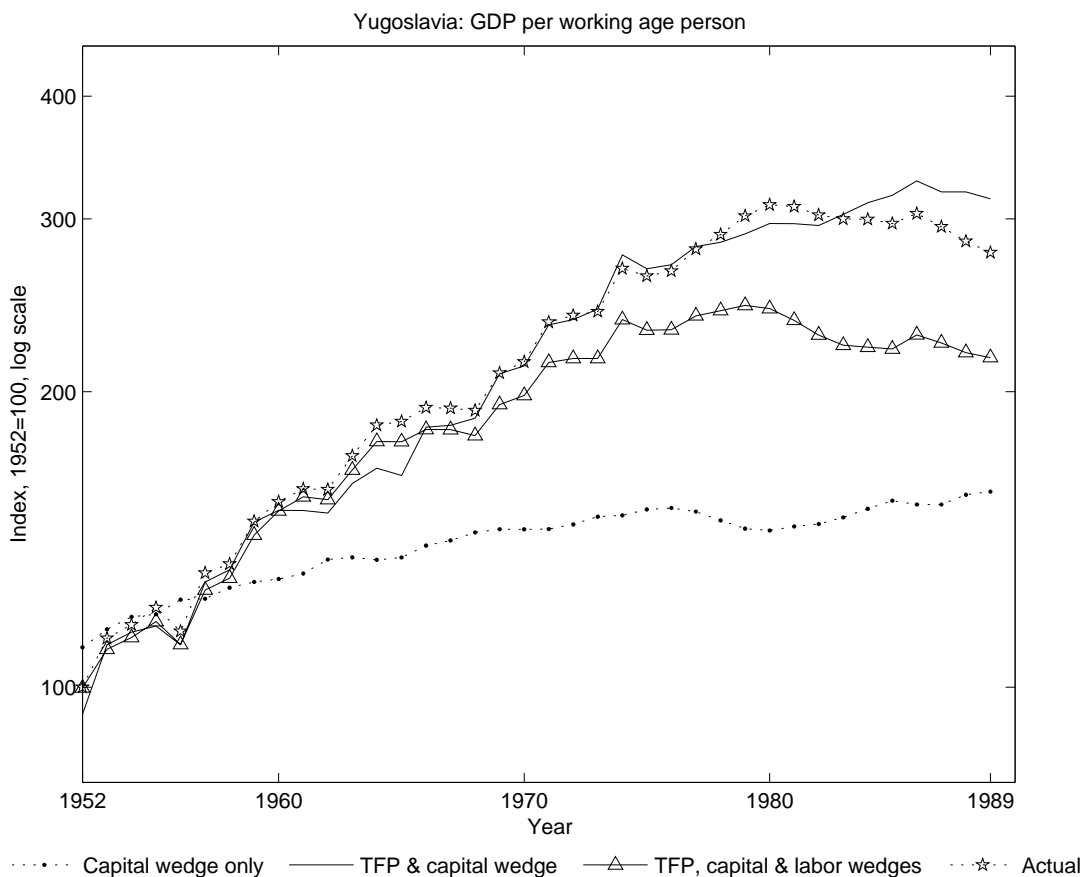
Notes: The 1952 level of GDP per working age person is indexed to 100. If the two lines move in parallel, it means that the combined capital, labour and income wedges are responsible for most of economic growth.

To gauge further the relative significance of wedges, figure 8 estimates the marginal contribution of each wedge to economic growth. It adds to the prototype model one at a time the capital wedge, TFP, the labour wedge, and the income wedge. The four wedges in tandem match the data (the line “actual”). When the sequential addition of wedges makes the simulated path of economic growth move more in tandem with the actual path of economic growth, the newly added wedge is responsible for that movement.

The model that includes just the capital wedge systematically under-estimates economic growth since the late 1950s, but before generates a higher level of growth than implied by data. When TFP is added to the model containing the capital wedge, the path of simulated

economic growth tracks the actual path closely. Thus, this model reconfirms that TFP became gradually more important in sustaining economic growth. When the labour wedge is added to the model containing the capital wedge and TFP, the simulated path of economic growth is close to the actual path until the 1970s, but at a somewhat lower level (the discrepancy is due to the remaining income wedge). Afterwards, the discrepancy between the actual path of economic growth and the simulated path widens, reconfirming the finding that the labour wedge was a major constraint on economic growth that furthermore drove the decrease of economic growth during the 1980s. The model with the capital wedge and TFP reinforces this finding, since it implies a higher level of GDP per working age person than the actual data from the mid-1980s.

Figure 8: Simulations of GDP per working age person versus the actual GDP per working age persons, 1952-89



7. Concluding remarks

Beyond the very recent past, and beyond the Soviet Union, we know very little about the nature of economic performance of eastern European countries. This paper fills the knowledge void by providing an analytic narrative of Yugoslavia through using a diagnostic tool that identifies the mechanisms that drive economic growth.

This paper argues that TFP increased in importance with the passage of time. Through adding a timing dimension, this paper reconciles the conflicting results in the literature about the relative significance of TFP and factor inputs in sustaining economic growth. It reconfirms that labour frictions were a major constraint on growth. For that matter, the deteriorating of the labour wedge was the most important driver of the deterioration of the economic performance of Yugoslavia. This does not mean that Yugoslavia did not fail to adapt to the requirements of flexible production technology in the late 1970s and the 1980s, or that it did not run into acute diminishing returns on capital in the same period. Rather, my results demonstrate that labour constraints seem to be quantitatively more important in causing the retardation of Yugoslav economic performance.

A natural step for further research would be to identify the causality between policies and the path of TFP and labour frictions. Gradual integration of Yugoslavia into global trade patterns, facilitated by the entry into the GATT in 1966, suggests that the dynamic efficiency gains from trade might have boosted TFP growth. I argued that increasing unemployment, and potentially labour unrest, is a proximate cause of the deterioration of the labour wedge. Nevertheless, more research is needed to understand the incentive or ability of individuals to provide work effort. This venue of research has been largely ignored by economists and historians alike.

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Appendix

Figure A.1 recreates figure 7 in the text, but it excludes agriculture to gauge the potential significance of structural change in driving the dynamics of TFP growth.

By excluding agriculture from the economy, I exclude potential improvements in resource allocation between agriculture and non-agriculture by definition. Figure A.1 reveals that the relative significance of TFP increased over time in the non-agricultural sector of the economy, the same as in aggregate economy depicted by figure 7. Thus, the finding is robust.

Figure A.1: The actual evolution of non-agricultural GDP per capita versus the counterfactual evolution of it (without TFP), 1952-89

