Traditional Technology and Cost-reduction As a Major Driver in Business: Can Outsourcing Relations be Redirected by Smart Manufacturing?

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Abstract. Traditional technologies can have an extended lifetime if companies use various cost-reducing strategies. One of these strategies employed in Western European countries in the past decades has been low-cost outsourcing in Central and Eastern Europe (CEE), mainly derived from low wages. Specifically, Czech Republic, Poland and Hungary are prime destinations for low-cost outsourcing. However, there is a trend of increase in wage levels in these countries, posing the question of how long (time-period) cost advantages can be gained in the CEE region in the future. Far distance outsourcing of manufacturing goods causes a lot of strain on transport and the environment, and in a situation of diminishing cost-advantages in CEE, the question can be posed to what extent traditional manufacturing can ‘return’ to Western Europe if smart manufacturing methods are being used. This study adopts a scenario-analysis approach in which four scenarios are drawn, particularly focusing on labor cost development and other cost advantages, and on other critical factors in outsourcing like availability of low-skilled labor and productivity changes. Each scenario will be examined in terms of attractiveness for outsourcing and potential implications on decisions for (continuing) outsourcing relationships with CEE. We also briefly reflect on potentials of ‘smart’ manufacturing in the Netherlands.

Keywords. traditional technology, low-cost strategies, outsourcing, Eastern Europe, comparative advantages, ‘smart’ manufacturing

1 Introduction

Throughout the last decade the competitive pressure in the developed economies has forced companies in many industries to cut cost and improve operational efficiency. A popular approach among labor intensive industries is the Low Cost Country (LCC) sourcing strategy. This is a procurement strategy in which companies use foreign partners, typically in developing, or less advanced economies with lower comparable labor cost, to produce components or entire end-products in manufacturing (e.g. Coyle et al., 2009).
CEE countries, particularly Poland, Czech Republic and Hungary, are popular sourcing destinations for Western European-based firms, especially for firms in the manufacturing industry, where a large share of the total expenditure is determined by material and labor costs. These firms implement the LCC sourcing strategy in order to reduce costs and stay competitive (van Geenhuizen and Nijkamp, 1998). The CEE countries, current members of the same economic bloc (European Union – EU), offer a huge cost reduction through lower labor expenses, combined with a relatively stable economic and political environment and cultural proximity, as well as lower transportation costs, in contrast to South East Asian economies, for example. While sourcing in the CEE region proved to be profitable in the past, sustained economic growth and social developments, leading to rising wages, call for a rethink of these countries as LCC locations. Labor costs in the CEE region have increased significantly faster than in Western Europe owing to a lower starting position. For example, in the period of 2000-2008, the wage levels increased by 68% in the Czech Republic and by 31% in Poland; they did so only by 22% on average in the Eurozone (OECD, 2011). Consequently, the wage gap between Eastern and Western Europe is set to diminish even further.

Firms eager to cut labor costs are often using traditional technologies, either in a relatively simple end-product or in part of the components that make up a high-tech end-product and in its assembly. For example, machines used in infrastructure work (landscaping, road and rail construction) and waste recycling are relatively simple end-products. In addition, various components in car industry, medical instruments, computers, electronic security systems, etc. are made by relatively traditional technology like in metalworking and molding, while the assembly may also use traditional technology as well as a high input of labor. While such firms could benefit from a clear sourcing advantage in the past, a great uncertainty whether this advantage will last is emerging. Firms find it more and more difficult to make well-grounded investment decisions or commit to long-term sourcing agreements as they lack a solid understanding of which environmental factors could critically impact their strategy. Specifically firms which have committed themselves to the LCC sourcing strategy may be impacted by rising wages in their preferred sourcing locations.

This paper explores the LCC sourcing strategy in the context of the EU, where CEE countries represent LCCs, with special attention towards its future prospects. We focus on Poland, Czech Republic and Hungary, as these countries benefited greatly from foreign direct investment (FDI) during their transition and presently foreign multinationals are responsible for a large share of their national economies. The key research question is: how will the current cost advantage develop until 2020, and what would be the implications for Western European manufacturing firms employing a LCC sourcing strategy? Methodologically, the scenario approach as implemented within this study is based on the context scenario approach and is at present applied by many decision- and policy makers to assess the robustness of their policies and strategies. The paper is structured as follows: section 2 develops a definition of LCC sourcing and identifies which alternatives are available for this strategy. This is followed by the development of our conceptual model and the scenario methodology in section 3. Section 4 describes different scenarios or future states. Finally section 5 offers the discussion and conclusions.
2 Low Cost Country Sourcing and Potential Alternatives

In order to develop an accurate definition for LCC sourcing, the phenomenon of global sourcing should be understood. According to Javalgi et al. (2009) the global sourcing strategy refers to “identifying which production units will serve which markets, and where will they get the components or processes required for production”. Mol (2001) focuses more on the inbound side of the firm and defines global sourcing as, “the decision-making process through which firms find and manage inputs for final production in an integrated, international context in order to contribute to the creation of sustainable competitive advantage by the firm”. The problem of the relative nature of the term “low cost country” should be tackled by identifying a common denominator for certain goods amongst different countries. Purchasing Power Parity (PPP) is a commonly used indicator, “in their simplest form PPPs are nothing more than price relatives that show the ratio of the prices in national currencies of the same good or service in different countries” (OECD, 2005). When the PPP is divided by the exchange rate a comparative price level is defined. Following the above reasoning, a definition of LCC sourcing can be formulated by combining the global sourcing definitions of Javalgi et al. (2009) and Mol (2001) together with the comparative price level as specified above. The definition of “Low Cost Country sourcing” which will be used throughout this paper is as follows: it is a strategy in which firms attempt to lower their cost, by cooperating with those suppliers that offer a lower comparative price level relative to domestic suppliers. In sum, this definition clarifies that LCC sourcing is a strategy in which firms seek for input products at a lower comparative price level.

An alternative to LCC sourcing could be to substitute labor by machines. Substitution may exist if there is an option to trade-off labor for more machine and capital intensive production methods (Johnson et al., 2008). In fact, many labor-intensive firms with a large share of labor costs in total cost are facing such a trade-off. If in the future either the costs of capital, by means of technological developments, or the costs of labor change, these firms to reconsider their decisions on LCC sourcing. LCC sourcing comes also under pressure if mass production is making place for mass customization, which causes the product design to vary and requires higher levels of integration and flexibility in supply chains. In fact, there is currently a call from industry leaders, academics, and politicians both in the European Union and United States to put more energy in what is named ‘smart manufacturing’ (EC, 2011; NIST, 2012). Smart manufacturing evolves through three steps thereby strongly supported by ICT, monitoring, and advanced simulation and modeling. (1) The integration of all manufacturing data throughout individual plants and across enterprises will facilitate significant, immediate improvements in costs, safety and environmental impacts. (2) This integration of data, paired with simulation and modeling, will create robust “manufacturing intelligence” that enables flexible manufacturing, optimal production rates, and faster product customization, with higher efficiency in supply chains. (3) As that manufacturing intelligence grows, it will inspire innovations in processes and products that comprise smart manufacturing’s promise, i.e. causing major market disruptions. However, it remains to be seen to what extent and in which pace ‘smart manufacturing’ can be introduced and make LCC sourcing an obsolete strategy.
3 Methodology: Conceptual Model and Scenario Development

3.1 Conceptual model

In our study, labor cost serves as a central variable. It is responsible for cost advantage and ultimately defines whether a location is a LCC or not. Cost advantage is also defined by other factors, such as balance of trade, inflation, transportation costs. Particularly, exchange rate is a key factor. EMU (Economic and Monetary Union), or “Eurozone” accession will have a direct impact on exchange rate, in fact, fixing national CEE currencies to the euro. Labor cost itself is determined by two fundamental factors – labor supply and labor demand, each of them in its turn is influenced by diverse factors. Further, labor cost is mediated by labor productivity. Labor supply, i.e. available workforce, is defined by population structure and unemployment. Labor demand, in its turn, is largely determined by the state of national economy, and economic growth in particular. Figure 1 illustrates this logic. For our purpose of developing future scenarios, we also consider technological development. If in Western Europe, technology development allows for increasing labor productivity and decreasing of domestic labor costs to levels comparable with those in Eastern Europe, or even introduce ‘smart manufacturing’ rather quickly, decisions on LCC sourcing could be reconsidered.

Fig. 1. Selected key factors influencing labor cost development in CEE (Berben, 2011)

3.2 Context scenarios

Context scenarios focus on the environment in which certain policies are implemented. They show how the world might look like in the future. A context scenario is a creative description of a future state based on a good scenario structure as well as consistent and logical reasoning. The scenario structure is based on critical uncertainties and forms the core of the scenarios (Enserink, 2004). Several authors have proposed methodologies to construct a good scenario (e.g. Reibnitz, 1988; Schwartz, 1991; Schoemaker, 1993; van der Heijden, 1996; Bradfield et al., 2005). The methods used largely overlap and two key steps are generic: the identification of
the focal question, and the identification of the key forces or mega trends in the environment. These forces represent the key uncertainties which form the scenario logic or skeleton of the future scenarios. Two things are important in identifying these mega trends, i.e. they should be independent and the uncertainties should be out of the span of control of the scenario makers. After close evaluation and ranking according to importance and uncertainty the scenario maker identifies those key uncertainties which form the basis for the scenario logic.

3.3 Scenario logic

The scenarios developed further are used to assess the possible impacts of uncertain but possible future developments on the cost advantage of sourcing in the CEE region. We set the year 2020 as the end date, and identify three independent uncertainties to form the scenario logic: accession to the EMU, pace of technological progress, and transition to a green economy.

The first uncertainty is a possible accession of Poland, Czech Republic and Hungary to the EMU. This accession will considerably impact the future cost advantage in these countries. In fact, a requirement to accede to the common European currency is an inseparable part of the EU membership and by signing the Treaty of Accession to the EU back in 2003, the countries committed themselves to switch to the euro at the moment they would comply with the conversion criteria. Yet, at the moment it is rather unclear when or even whether they will adopt the euro after all. The current Euro crisis shattered the governments’ and investors’ confidence in the future competitiveness of the euro as a common currency. Presently accession to the debt-ridden Eurozone may not seem as attractive as it was a few years ago. Responding to the public negative sentiment, national political leaders may readjust the policies and delay the accession.

The second major uncertainty is the pace of technological progress. Technology advances the aggregate level of productivity by enabling ever advancing equipment and manufacturing processes. Because the manufacturing industry will be heavily influenced by changes in the status of technology, the speed of technological development is taken as an uncertainty. We may think, for example, of improved and cost-effective combinations of information technology and robotics, allowing for replacing mass production by mass customization, thereby creating better options of domestic manufacturing in Western European countries (EFFRA, 2012).

The final development is the transition towards a green economy. The manufacturing industry is expected to reduce carbon emissions and pollution, and to enhance energy and resource efficiency. By binding legislation and increasingly strict environmental policies, governments aim to safeguard the natural environment by raising the costs for manufacturers, e.g. CO₂ emission taxes, trade duties, waste and recycling fees. Because at present there is uncertainty about possible evolution of environmental policies, we frame the scenarios towards the intensity of these policies. The discussed uncertainties represent three axes within the scenario logic as illustrated in Figure 2.
Starting at the center of the three axes, the “Business As Usual” scenario represents a future state in which all above indicated uncertainties have not materialized, and status quo of the current situation is maintained. The scenario logic indicates the different directions the future might shape. At the ends of each axis the particular uncertainty has evolved towards an extreme form which heavily impacts the current manufacturing industry. The extremes of each axis should be regarded as huge developments of the underlying uncertainty. For the “EMU” axis the extreme means a completed accession of Poland, Czech Republic and Hungary to the Eurozone. The extreme of the “Technological development” axis represents the state resulting from technology progressing at a double rate and huge efficiency increases in production in a relatively short time. The extreme “Green transition” axis represents a situation in which the governmental bodies have fully implemented a legally binding and extensive framework in order to preserve the natural environment. As illustrated in Figure 2, apart from the “Business As Usual” scenario, three other scenarios are yielded by combining the evolution of three uncertainties, namely, “Sustainable Euro”, “Equal Europe” and “Double Growth”.

4 Scenarios

Hereafter, the four future states, Business As Usual, Sustainable Euro, Equal Europe and Double Growth, are characterized and their case specific implications are imposed on the historical trends of the most important environmental factors in order to construct a future perspective of the cost advantage of outsourcing strategies.

4.1 Business As Usual

Within this first future state it is assumed that all three uncertainties have not materialized, and the European economic environment in 2020 is comparable with the situation as it was in 2010. Poland, Czech Republic and Hungary either fail to attain the convergence criteria to join the EMU or intentionally avoid accession due to political reasons. Overall, the business climate did not change as a consequence of the identified uncertainties, but some prominent trends within the identified most
important factors did alter the sourcing advantage: the exchange rates of the CEE countries and the age composition of the region’s population. Regarding the exchange rates, the most important and influential changes occurred within the Czech Republic and Hungary. This age distribution has altered over time by fluctuation in the historical birth rates and the longer life expectancy. According to the above discussed scenario and the composition of the labor force in particular, the wages are expected to increase at a considerable faster pace within the CEE region compared to Western Europe. The decreasing working age population within the Czech Republic and to a lesser degree in Poland and Hungary does create this huge upwards pressure due to an increasing scarcity of the labor force.

The average wage, together with the exchange rate developments ultimately determines whether the cost advantage of sourcing in CEE will sustain under the assumptions of the Business As Usual scenario. In the Czech Republic, the labor cost has developed considerably, together with the strengthened Koruna, sourcing to a Eurozone country will experience a considerably lower cost advantage. Similar to the Czech Republic there will be an increasing pressure on the wages within Poland and Hungary. It is, however, the Hungarian Forint which dampens and even compensates this increase in labor cost in the long run. Impacted by a depreciating currency, sourcing in Hungary will experience a slight increase in the total cost advantage by 2020. Under the assumptions of an increasingly scarce labor market and relative stable exchange rate, sourcing in Czech Republic will experience the negative effect of the lowered supply of labor force. Therefore sourcing in Czech Republic will become more expensive. Poland, however, remains somewhat more favorable for sourcing due to labor flow from agricultural areas to urban centers.

4.2 Sustainable euro

The sustainable euro scenario projects a future state in which recent legislation has become a tool for governments to protect the natural environment, and where the CEE countries have joined the EMU and adopted the euro. Mostly driven by international organizations and agreements, the national economies in 2020 are heavily regulated – trade, production and even new infrastructural projects have to comply with stricter legislation. It is the production costs that are greatly affected; additional cost to tackle the industry’s by-products like toxic metals, chemicals and CO2 emissions as well as additional cost for the generation of renewable energy raise the cost of production throughout the whole Eurozone. These developments do impact the cost advantage. Convergence criteria requiring lower and stable interest rates in combination with the disappearing exchange rate volatility created an attractive investment climate in CEE. The price transparency resulting from the common currency in combination with the lowered transaction costs made products in the CEE countries more attractive for foreign consumer markets and boosted their exports and the balance of trade. However, apart from the EMU accession, the increased production cost caused by strict environmental legislation dampens the economic growth. Between the moment of accession to the Eurozone and the implementation of the new sustainable measures the GDP in CEE countries might grow considerably. After the implementation of the “green” legislation, the GDP growth in the entire Eurozone decreased. As the level of technological development has not rapidly grown in the Eurozone, subsequently the
labor productivity will not enhance either. The economic growth in the CEE countries produces an increased demand for products and services. The prosperous economy has a downwards pressure on the unemployment in the region. The relative scarcity on the labor market caused by the improved economic climate declines after the implementation of the strict environmental legislation. This effect will ultimately have a negative pressure again on the wage development. The cost advantage for Western European firms of sourcing in the new Eurozone members Poland, Czech Republic and Hungary, besides the labor costs, will also be impacted by the increasing transport cost due to stricter environmental rules. Costs relating to CO2 emission taxes, fuel taxes and road fees have an adverse effect on the total cost advantage. The labor and transportation costs taken together determine decreasing advantage.

4.3 Equal Europe

The third scenario is shaped by two forces – (1) the accession of Poland, Czech Republic and Hungary to the EMU, and (2) a rapid improvement in technological development in the entire Eurozone. There is no additional regulatory “green” pressure in this scenario. This is partly a result from the advanced technologies in the manufacturing industry that lessened the burden on the natural environment. The accession of the three countries to the Eurozone has greatly enhanced the region’s economic progress. The transparent prices and diminished transactions costs greatly boost exports. The combination of stable interest rates and the disappearing exchange rate risk lead to higher volumes of FDI inflows and thus boosting the economic growth. The direct relation between technological progress and labor productivity causes the labor productivity to grow considerably. Therefore the wages in Poland, Czech Republic and Hungary develop at a considerably high pace.

In order to determine the actual cost advantage of sourcing in CEE, it is important to take the possible substitution effect into account. This effect does in essence reflect the possibility of firms to trade off labor-intensive for capital-intensive production. A firm will be faced with a trade-off decision if it experiences high labor costs and the technological development reaches a level at which it is possible to automate diverse production processes. It is either able to source the products from a different, mostly geographically remote location, which offers lower comparable labor costs, or to produce the products in-house according to a capital-intensive production process that has replaced the manual labor. In this scenario the tipping point in the industry has not been reached yet, however it has come closer and will soon be a feasible option. In the year 2020, the total cost advantage is still sizeable to keep sourcing agreements with suppliers in Poland, Czech Republic and Hungary. However, the wage levels of the CEE region have increased substantially after the accession to the Eurozone.

4.4 Double growth

The fourth scenario represents a future state in which the technological development already started to progress rapidly after 2010, new breakthrough technologies swiftly increased the efficiency among manufacturing firms and transport became more fuel-efficient. However, another trend influences the ultimate cost advantage. It is new environmental legislation strictly regulating the manufacturing-intensive industries
and burdening economy with additional fees and taxes. As for the CEE region, the measures are even heavier due to a production tax intended to cover governments’ payments for the sustainable transition. The CEE countries were over-taxed due to the use of polluting production methods over the recent decades. Because the CEE countries did not attain the convergence criteria, they still use their own national currencies. The impacts of the developments in this scenario on the cost advantage are multidimensional. Firstly, due to the fast technological progress the levels of productivity have risen all over Europe and influenced the average wage levels. The new and stricter environmental policies heavily burden the CEE manufacturing industry, causing the exports of the region to decrease.

With the support of EU and national policy, manufacturing in Western Europe has dramatically changed by large scale introduction of advanced production technologies and mass-customization. Together with the rising costs of sourcing in CEE, Western producers were encouraged to invest in technologically advanced production facilities combining newest information technology with robotics in their own region thereby substituting the labor-intensive production in CEE for capital-intensive production at home in the West (smart manufacturing). This pull-out of the manufacturing activities out of CEE led to a subsequent loss in exports and declining FDI inflows. This undermined competitiveness is balanced in the short run by devalued national currencies. Yet, it is questionable whether the CEE economies will be able to attract their initial production capacity as the western firms have already invested heavily in new high-tech and flexible automated production plants in the frame of smart manufacturing at home. Ultimately, Poland, Czech Republic and Hungary suffer from a considerably decreased cost advantage due to the stricter environmental legislation. Although their currencies devaluate, this is probably not enough to regain their comparative cost advantage. Sourcing from all three CEE countries became too expensive and by using smart manufacturing, western firms started to produce domestically.

5 Discussion and Conclusions

In our study we constructed four future states which could impact the current cost advantage of production in Poland, Czech Republic and Hungary. This was done according to possible future developments of three independent uncertainties. The cost advantage under the ‘Business As Usual’ scenario would not undergo noticeable changes in the short run, but in the long run the increasing scarcity of the CEE workforce and the exchange rates make the current sourcing strategy less profitable in the Czech Republic. In Hungary, however, the cost advantage will slightly increase due to its devaluating currency, and in Poland the situation tends to remain stable due to inflow of agrarian workers in industrial towns. In the ‘Sustainable Euro’ scenario, the cost advantage would ultimately decrease in the entire CEE, yet, not enough to diminish the profitability of sourcing there completely by 2020. What does change, however, is the demand for manufactured products – an increasingly sustainable world would demand more ‘sustainable’ products, e.g. resulting in an increase in the waste and recycling tools. In the ‘Equal Europe’ scenario the cost advantage would not change in the short run, but in the long run the EMU accession will ultimately
lower the cost advantage due. Nevertheless, sourcing in all three countries will remain profitable by 2020. The ‘Double Growth’ scenario presents a different outcome. Due to the increasing production costs in the CEE region and the increasingly technology-driven and capital-intensive production methods in Western Europe, sourcing in CEE will lose its competitiveness and no longer presents a cost advantage by 2020. Western European firms invest in automated production facilities at home.

This research aimed to provide manufacturing firms committed to a LCC sourcing strategy with a tool that gives more confidence in making thoughtful investment decisions or committing to even longer-term sourcing agreements. The contribution of this paper to the literature is as follows. Scenario analysis as presented here using context-scenarios is relatively scarce in the context of long-range business planning, particularly in supporting decisions on cost-reduction investments. Our research results illustrate that firms employing a LCC sourcing strategy should thoroughly investigate the future potential of the national labor market in the respective host countries. If the labor within these countries is expected to become scarce in the long run it is very likely that the wages will rise accordingly. In the long run, economic growth of CEE countries, driven by FDI, balance of trade and interest rate, will have a gradually diminishing effect on the initial cost advantage. An influential factor directly impacting the cost advantage is the exchange rate of the sourcing countries’ currencies. In the short run, factors like labor market policies, environmental protection and a possible EMU accession of the sourcing countries determine the cost advantage most. While these factors are widely identified as key determinants of the LCC cost advantage, their future developments are rather difficult to predict. Historical developments might project future performance, but the future is and will always remain unpredictable; therefore a set of scenarios exhibiting possible future states can help companies anticipate changes, which cannot be foreseen by the historical trends. It is a must for firms to be prepared for possible future contingencies; a scenario approach is an appropriate tool to for doing this.

One of these scenario’s includes a move to ‘smart manufacturing’ allowing for better integration within firms and supply chains, and moving away from mass-production to mass-customized production. Accordingly, customer needs will be better served, including low costs. Though it is not known to which extent ‘smart manufacturing’ will be introduced and at what pace, this scenario will make firms to decide to bring back parts of manufacturing to Western European countries. If such a scenario is seen by policy makers as favorable for their economies, steps need to be taken to facilitate the realization of such a scenario. A first step in support could be to establish smart manufacturing process innovation centers, through investment in public-private partnerships, with ‘test beds’ and other experimentation places to catalyze the changes foreseen.

References


