

# pregledni naučni članak



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*Nobelova nagrada za 2010.*

## DMP MODEL

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### Rezime

Piter Dajmond, Dejl Mortensen i Kristofer Pisarides su Nobelovu nagradu 2010. godine dobili za doprinos analizi tržišta sa poteškoćama u usklađivanju ponude i tražnje, naročito pri zapošljavanju. Kreatori su modela DMP, nazvanom po prvim slovima njihovih prezimena. Danas je to analitički instrument koje se najviše koristi za analizu nezaposlenosti, formiranja zarada i upražnjenih radnih mesta.

**Ključne reči:** DMP model, (ne)zaposlenost, zarada, tržište rada, istraživanje, teorija, Piter Dajmond, Dejl Mortensen, Kristofer Pisarides

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*Nobel Prize for 2010*



# DMP MODEL

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## Summary

Peter Diamond, Dale Mortensen and Christopher Pissarides won the 2010 Nobel Prize in Economic Sciences for their contribution to the analysis of markets with search frictions, especially when it comes to employment. They created the DMP model, named after the first letters of their last names. Today this is an analytical instrument most used for analyzing unemployment, formation of wages and job vacancies.

**Keywords:** DMP model, (un)employment, wages, labor market, research, theory, Peter Diamond, Dale Mortensen, Christopher Pissarides

**JEL:** A13, B31, E24, J64

**U**2010. godini Nobelova nagrada za oblast ekonomskih nauka dodeljena je trojici naučnika: Piteru Dajmondu, Dejlu Mortensenu i Kristoferu Pisaridesu. Ovo priznanje dobili su za doprinos analizi tržišta sa poteškoćama u usklađivanju ponude i tražnje, naročito pri zapošljavanju. Kreatori su modela DMP, nazvanom po prvim slovima njihovih prezimena. Danas je to analitički instrument koji se najviše koristi za analizu nezaposlenosti, formiranja zarada i upražnjenih radnih mesta. Ovaj model se može koristiti i za procenu uticaja različitih faktora tržišta rada na nezaposlenost, plate i slobodna radna mesta.

Britansko-kiparski ekonomista Kristofer Pisarides profesor je na Londonskoj školi ekonomije i u svom istraživačkom radu fokusirao se na nekoliko tema iz područja makroekonomije, prvenstveno na ekonomiju rada, privredni rast i ekonomsku politiku.

## Detinjstvo

Otac Kristofera Pisaridesa, Antonios, rođen je u Agrosu, na Kipru, smeštenom u dolini planine Trodos koja sa tri strane okružuje ovo selo. Odrastao u porodici sa sedmoro dece, već sa 10 godina odlazi od roditelja kod rođaka u Nikoziju da radi u njihovoj trgovini. Sa 20 godina se osamostaljuje, otvara prodavnicu materijala za odeću i stvari za kuću. Evdokija Georgijades, Kristoferova majka, rođena je u Nikoziji u dobrostojećoj porodici. Završila je francusku školu i tečno govorila, pored maternjeg francuski i engleski jezik. Venčali su se 1943. godine i dobili dve crke i sina: Maro, Anu i Kristofera.

Kristofer je rođen 1948. godine u Nikoziji. Imao je srećno detinjstvo i sa lepim uspomenama seća se dečijih igara, zalazaka sunca, pecanja, rada na poljima i nedeljnijih odlazaka u pravoslavnu crkvu. Na Kipru, britanskoj koloniji, časovi u osnovnim školama

bili su često prekidani zbog učestalih nemira u borbi za nezavisnost. Kristoferovi roditelji su veoma cenili obrazovanje te su ga naterali na dopunske časove i van škole. Gimnaziju je završio u Nikoziji, ali kako ističe od 11 godina provedenih u školskoj klupi samo tri nisu bile prekidane vojnicima, bombama, zviždanjem metaka. Srednju školu je završio sa sedamnaest godina što ga je spasilo vojne obaveze jer se u vojsku odlazilo sa navršenih 18 godina. Kao i drugi dobrostojeći Kiprani, otišao je u London na studije ekonomije.

## Studije

Prvobitna želja mu je bila da studira arhitekturu, ali su mu roditelji savetovali i na kraju ga i ubedili da to bude ekonomija. Iako je matematika bila njegova velika ljubav, smatrao je da to nije dobra profesija za mladog čoveka. Pohađajući pripremna predavanja za upis na fakultet svidele su mu se ekonomski studije i rešio je da tu i ostane. Prijave za upis na fakultet poslao je na šest adresa što je bio maksimalan mogući broj imajući u vidu njegovu prethodnu školsku spremu.

Primljen je

na Eseks univerzitet, koji je kao novi univerzitet na odseku za ekonomiju imao puno mladih, uspešnih akademaca iz Londonske škole ekonomije. Kristofer je bio oduselen kampusom koji mu je olakšavao integraciju u studentski milje Londona. To je

za njega bilo prijateljsko mesto, sa puno sadržaja za mlade. Na ovom fakultetu stekao je brojne prijatelje, a kada ga je završio profesori su mu savetovali da ode na Harvard, odakle mu je i stigla ponuda za nastavak studija. U tom periodu upoznao je i Dejla Mortensena koji ga je pozvao da pređe na Nortvestern i da s njim radi doktorsku disertaciju. Odbio je oba poziva i opredelio se, iz praktičnih razloga, jer je smatrao da je Amerika



In 2010 the Nobel Prize in Economic Sciences was awarded to three scientists: Peter Diamond, Dale Mortensen and Christopher Pissarides. They won this award for their contribution to the analysis of markets with search frictions, especially when it comes to employment. They created the DMP model, named after the first letters of their last names. Today this is an analytical instrument most used for analyzing unemployment, formation of wages and job vacancies. This model can be used to assess the impact of various factors of the labor market on unemployment, wages and job vacancies.

The British-Cypriot economist Christopher Pissarides is a professor at the London School of Economics, focusing in his research work on several topics in the field of macroeconomics, primarily labor economics, economic growth and economic policy.

## Childhood

The father of Christopher Pissarides, Antonios, was born in the village of Agros, in Cyprus, a village in a valley surrounded by the Troodos mountains on three sides. He grew up in a family with seven children, and already at the age of ten he was sent to Nicosia to work as a shop assistant for his uncle. In his twenties he became independent, having opened his own shop, selling fabrics and other items for the home. Christopher's mother, Evdokia Georgiades, was born in Nicosia to a better-off family. She went to a French school and learnt to speak fluent French and English, in addition to her mother tongue. They got married in 1943 and had

two daughters and a son: Maro, Anna and Christopher.

Christopher was born in 1948 in Nicosia. He had a happy childhood, with fond memories of the childhood games, sunsets, fishing, work on the fields, and Sunday service at the Orthodox church. In Cyprus, a British colony, lessons in elementary schools were often interrupted due to frequent clashes during the fight for independence. Christopher's parents, who valued education greatly, made him take lessons from tutors outside school as well. He graduated from high school in Nicosia, but as he underlines, out of the eleven years that he spent in schools, only three were not disrupted by the sound of marching soldiers, exploding bombs or flying bullets. He finished high school at 17 instead of the usual 18, and was considered too young to serve in the army. Like many well-off Cypriots, he went to London to study for a degree in economics.

## Studies

Originally, he wanted to study architecture, but his parents advised him, and finally persuaded him to try economics instead.

Although his love at school was mathematics, it was not considered to be a good profession for a young man, with which he agreed. During his college preparation lectures, he tried economics and liked it, so he decided to pursue his studies in it. He applied to the maximum six universities that he was allowed by the central office of university admissions, taking into consideration his school background.

He was accepted by the University of



Kristofer Pisarides prima nagradu od švedskog kralja Gustava XVI u Stokholmskoj koncertnoj dvorani 10 decembra 2010.  
Christopher A. Pissarides receiving his Prize from His Majesty King Carl XVI Gustaf of Sweden at the Stockholm Concert Hall, 10 December 2010

daleko, za Londonsku školu ekonomije.

Britanski univerziteti, za razliku od Harvarda, nisu tako lako donosili odluke o redovnom stipendiranju svojih studenata, ali je Kristoferov otac bio spremna da plati studije svoga sina. O tome Kristofer Pisarides kaže: „Desilo se za ovu kao i za sve ostale moje diplome da sam dobio stipendiju i da otac nije morao da plaća moje studije, ali bez njegove pomoći svakako ne bih mogao da živim u Velikoj Britaniji“.

Po Kristoferovim rečima Londonska škola ekonomije je bila dosta neorganizovana kada su u pitanju doktorska istraživanja, ostavljajući studente da se sami snalaze u traženju tema i pisanju disertacija. Svoj mentora Mičia Morišimu upoznao je još na Eseksu. Međutim, on nije bio zainteresovan za područja koja su Kristofera zanimala, a to je, pre svega, bilo istraživanje teorije nezaposlenosti.

Na univerzitetu je imao prilike da se upozna sa delima brojnih poznatih ekonomista. Čitajući Semjuela Karnila, počeo je da razmišlja o ljudskom kapitalu radnika kao imovini koju on može da proda na tržištu rada, gde je pronalaženje posla neizvesno. Probao je da radi na toj ideji i za šest meseci uradio je istraživanje koje je bilo prihvaćeno za njegovu doktorsku disertaciju. Kasnije je ovaj rad objavljen i u formi knjige u izdanju Kembriđa.

## Na početku istraživačkog rada

Iako su mu profesori savetovali da po doktoriranju ostane u Velikoj Britaniji ili ode u SAD Kristofer se vratio na Kipar 1973. godine. Februara 1974. zaposlio se u istraživačkom centru centralne banke. Te godine, u julu, otišao je u Atinu kod svoje devojke koja je završila LSE i sa kojom se ranije dogovorio da dođe da živi na Kipru, da se tamo venčaju, a potom pronađu neki akademski posao u Britaniji. Nije ni slutio da je to bio jedan od poslednjih civilnih letova sa Kipra. Vojska Grčke zbacila je Makariosa i uvela vojnu diktaturu. Turska armija je napala i podelila Kipar na dva dela. U tom periodu njegovi roditelji su otišli na selo i on sve do prestanka diktature nije imao informacije o njima.

Saznao je da dva univerziteta u Britaniji imaju potrebu za predavačem. Konkurisao je

i bio primljen na oba univerziteta. Odabralo je Southampton univerzitet na kome je predavao poslovnu ekonomiju na drugoj godini. Život u Sauthemptonu bio je težak, a predavanja na univerzitetu te godine dosadna i zato, iako mu je ugovor produžen, Kristofer 1976. odlazi u London na LSE. Nakon 2-3 godine jedan od

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Essex, which, being new, had the economics department set up by young successful academics from the London School of Economics. Christopher was thrilled by the campus, which helped him integrate more easily into the London student life. It was a friendly place for him, offering a lot of facilities for young

people. At the university he made many friends, and upon graduation his professors advised him to go to Harvard, from which he got an offer. It was then that he met Dale Mortensen, who invited him to go to Northwestern to do a PhD with him. He declined both invitations and decided, for practical reasons, to move to the London School of Economics, because he considered America to be "too far".

Unlike Harvard, British universities were particularly bad at making up their minds about funding in timely fashion, but Christopher was fortunate to have his father's promise that he would pay for all the costs of his education if he needed it. In this respect, Christopher Pissarides says: "Eventually all my higher degree education was financed by scholarships, so I did not have to draw on that promise, but without it I couldn't have stayed in Britain."

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According to Christopher, LSE had a completely disorganized approach to doctoral research, leaving students alone to find a topic and write a thesis. He had met his supervisor, Michio Morishima, at Essex before he moved to LSE. However, he was not interested in the topics that Christopher got interested in, i.e. primarily search theory and unemployment, which he wanted to research. At the university he had a chance to read the works by many famous economists. Reading Samuel Karlin made him think of a worker's human capital as an asset that he sells in the labour market, where job outcomes are uncertain. He tried to work on the idea and within six months he had a thesis in search theory that was approved for the degree of PhD. Soon after it was published as a book by Cambridge University Press.

## Early Research Work

Although his professors were putting a lot of pressure on him to stay in Britain, or try America, he returned to Cyprus in 1973. In February 1974 he took a job in the research department of the central bank. The same year, in July, he went to Athens to visit his girlfriend, who also graduated from LSE, and with whom he had previously agreed that she would move to Cyprus to live with him, where they would get married and afterwards try for academic jobs in Britain. He could not even imagine that that

starijih kolega preporučio ga je kao predavača na zimskoj radionici u Nemačkoj, gde je imao priliku da drugim mladim ekonomistima iz Evrope izloži svoje ideje. Ta predavanja su bila radna verzija materijala zbog koga je kasnije i dobio Nobelovu nagradu za ekonomiju.

Učesnicima se predavanja nisu preterano svidela, budući da su se, po njihovom mišljenju, zasnivala na previše prepostavki. Sličnog mišljenja, nažalost, bili su i recenzenti, te je imao poteškoća prilikom objavlјivanja svojih ranih radova. Ričard Lajard mu je predložio da bude član neformalne grupe za ekonomiju, što je on i prihvatio. Profesionalno iskustvo Džordža Akerlofa i Dženet Jelen koje je upoznao na LSE pomogla su mu u njegovom boljem stručnom pozicioniranju. Takođe, dopao im se njegov istraživački rad o nezaposlenosti i savetovali su ga da nastavi da se bavi time. Ford fondacija finansirala je njegov odlazak za SAD, na Harvard, gde će raditi godinu dana (1979-1980) i napisati svoja dva rada o edukaciji.

### Tri laureata

Na Harvardu je upoznao Martina Feldštajna koji mu je predložio da dođe u NBER u



Kristofer Pisarides u Stokholmskoj koncertnoj dvorani 10 decembra 2010. godine

Christopher A. Pissarides at the Stockholm Concert Hall,  
10 December 2010

Masačusets aveniji. Dopao mu se rad u NBER i na njegove seminare odlaziće godinama. Na jednom od njih upoznao je Pitera Dajmonda koji mu je govorio o svom istraživanju koje je bilo slično njegovom. Kristofer je nastavio da razvija svoju teoriju, fokusirajući se na tržište rada, zakone i uzročnike porasta nezaposlenosti. Dajmonda je do dobijanja Nobelove nagrade viđao još nekoliko puta.

Kada se vratio sa Harvara radio je na sklapanju teorije i tada je već znao da se nalazi na dobrom i ispravnom putu. To je bio, kako sam ističe, početak njegovog najplodnijeg stvaralačkog perioda koji će trajati oko pet godina. U tom periodu se razveo od prve žene i šest meseci proveo na Princeton univerzitetu, SAD. Tamo je, po sopstvenom priznanju, napisao najbolje radove.

Ričard Lajard je u Londonu osigurao finansiranje Centra za ekonomiju rada i, kako je on formiran pri LSE, Kristofer je postao jedan od njegovih prvih članova. Ponovo se oženio i dobio dvoje dece: Entonija i Mirandu. Na Berkli univerzitet, Kalifornija, odlazi 1990. godine na godinu dana. Tokom posete Nortvesternu imao je priliku da bolje upozna Dejla Mortensena i započne zajedničku saradnju, koja je trajala čitavih 10 godina. To je bilo lepo i produktivno prijateljstvo koje će iznedriti i DMP model. Knjiga koju su zajednički napisali postaje poznata i to mu finansijski omogućava da više vremena posveti deci i putovanjima na Kipar.

U periodu od 1996. do 1999, dok je bio upravnik katedre na LSE, pridružio im se Toni Gidens koji je želeo da od LSE napravi prestižni centar za istraživanje društvenih nauka u Evropi. U to se uključio i Kristofer. Njegovo istraživanje je postalo mnogo poznatije kada je sa Dejlom dobio nagradu IZA za ekonomiju. Dobija i više ponuda za predavanja u inostranstvu. Razvodi se i od druge žene 2008. godine. Od tada više vremena provodi na novim interesantnim istraživanjima i na predavanjima na Univerzitetu na Kipru.

### Istraživanjem do Nobelove nagrade

Neregulisano i otvoreno tržište je klasičan model konkurenčije i dovodi do jedinstvenog i najefikasnijeg ishoda. Međutim, kada se primeni koncept troškova koji nastaju u procesu, dolazi



Kristofer Pisarides sa sinom Entonijem i čerkom Mirandom  
Christopher A. Pissarides with his son Antony and daughter Miranda

would turn out to be one of the very last civilian flights from Cyprus. The Greek army overthrew the government of Makarios, replacing it with Greek military rule. Within days the Turkish army invaded and divided the island of Cyprus into two parts. Christopher's parents escaped to the village and he lost all communication with them until the dictatorship days were over.

He found out that two universities in Britain had open positions for lecturers. He applied and was offered both jobs on the spot. He chose the University of Southampton, where he taught business economics to second year students. Life in Southampton was tough, and lectures at the university that year boring, which is why, although his lectureship was renewed, in 1976 Christopher went to London to teach at the LSE. Two or three years afterwards, one of his senior colleagues recommended him as a lecturer for a winter retreat in Germany, where he was given the first chance to present to other young economists from Europe his ideas. Those materials were the early version of one of the papers cited by the Economics Prize committee.

The participants did not like his lectures very much, saying that, in their opinion, they assumed away too many things. Unfortunately, the journal referees were of a similar opinion, and Christopher had difficulties publishing his first papers. Richard Layard suggested him to join an informal group for economics, which he accepted. The professional experience of George Akerlof and Janet Yellen, whom he met at the LSE, helped him make his work

better known. What is more, they liked his research paper on unemployment, and advised him to pursue that line of thinking. The Ford Foundation financed his trip to Harvard, USA, where he spent a year (1979-1980) and wrote two papers on education.

### Three Laureates

At Harvard Christopher met Martin Feldstein, who suggested to him to visit the NBER in Massachusetts Avenue. He loved it there, and attended the NBER seminars practically every year since then. At one of their seminars, he met Peter Diamond for the first time, who told him about his research, which was similar to his. Christopher continued to develop his theory, focusing on labour markets, policy and explanations of the rise in unemployment. He met with Peter Diamond several more times before the Nobel Award ceremony.

On his return from Harvard he was deep into search and matching theory, and he knew then that he was on to something good. This period, as he himself underlines, marked the beginning of his most productive and innovative period, which lasted for about five years. During that time he divorced his first wife and spent six months at Princeton University, USA. According to his own words, it was there that he wrote his best papers.

In London, Richard Layard had secured funding for a research centre in labour economics, and since it was created at LSE, Christopher became one of its first members. He got married again and had two children: Antony and Miranda. In 1990 he went to the University of California at Berkeley for a year. During a short visit to Northwestern he got to know Dale Mortensen better, and they started their collaboration, which lasted ten years. It was a wonderful and productive friendship, which also generated the DMP model. The book the two of them wrote together gained some recognition, granting him financial freedom, and enabling him to spend more time with his children and travel more frequently to Cyprus.

do mogućeg postojanja više tržišnih rezultata. Peter Dajmond je u svom istraživanju pokazao da je samo jedan najbolji. Time ukazuje na uverljiv razlog državne intervencije kako bi se privreda usmerila ka najboljem ishodu. Dejl Mortensen i Kristofer Pisarides krenuli su od Dajmondove teorije u istraživanju tržišta rada i nezaposlenosti. Tako su došli do DMP modela.

„DMP model je danas najkorišćenije analitičko sredstvo za analizu nezaposlenosti, formiranja zarada i upražnjenih radnih mesta. DMP model objašnjava proces traženja posla nezaposlenih, ponašanja firmi pri zapošljavanju, kao i formiranje zarada. Kada se susretna ponuda i tražnja na tržištu rada, zarade se formiraju na osnovu samog stanja na tom tržištu (broja nezaposlenih i broja slobodnih radnih mesta).“

Ovaj model se može koristiti kod procene uticaja brojnih različitih faktora tržišta rada na nezaposlenost, plate i slobodna radna mesta. Ovi faktori mogu predstavljati iznos naknade za nezaposlene, realnu kamatnu stopu, efikasnost agencija za zapošljavanje, troškove koji se odnose na zapošljavanje i otpuštanje radnika, itd. Ako se nezaposlenost i raspoloživa radna mesta kreću u suprotnom pravcu, to oslikava promene u potražnji koje nastaju u privrednim ciklusima. Ako se i nezaposlenost i broj radnih mesta povećavaju istovremeno, to oslikava promene na tržištu rada: slabija efikasnost susretanja ponude i tražnje kao i strukturne promene koje omogućavaju firmama da lakše otpuštaju radnike. Ovakav sled događaja može omogućiti dugoročnu tendenciju nezaposlenosti.

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The three years that he was head of department, from 1996 to 1999, coincided with the arrival of Tony Giddens, whose objectives were to make LSE the pre-eminent social sciences research centre in Europe. Christopher joined this project. As his work became better known, especially after winning the IZA prize in labour economics with Dale, invitations to deliver lectures abroad were coming at higher frequency. He divorced his second wife in 2008. Since then he has been spending more time pursuing new research interests, and lecturing at the University of Cyprus.

### Through Research to Nobel Prize

A non-regulated, open market is a classic competition model, leading to a unique and most efficient outcome. However, when we apply the concept of costs incurred in the process, the possibility of multiple market results arises. In his research Peter Diamond proved that only one of them is the best. He thereby indicates that there is a convincing reason for state intervention in order to channel the economy towards the best possible outcome. Dale Mortensen and Christopher Pissarides started from Diamond's theory on labour market and unemployment. This led them to the DMP model.

"Today DMP model is an analytical instrument most used for analyzing unemployment, formation of wages and job vacancies. DMP model explains the process of job search by the unemployed, behavior of companies when hiring people, and formation of wages. When there is a matching supply and demand at the labour market, wages are formed based on the very position at that market (number of unemployed and number of job vacancies)."

This model can be used to assess the impact of various factors of the labor market on unemployment, wages and job vacancies. These factors may include the amount of compensation for the unemployed, real interest rate, efficiency of employment agencies, costs related to hiring and firing employees, etc. If unemployment and job vacancies are moving in opposite directions, this reflects the changes in demand occurring in economic cycles. If unemployment and job vacancies are simultaneously increasing, this reflects the changes at the labour market: lower efficiency of matching supply and demand, and the structural changes enabling companies to fire employees more easily. Such developments may facilitate long-term tendency of unemployment.